FUJITSU

FUJITSU Software
Interstage AR Processing Server V1.1.1

Overview

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Preface

Purpose of this document

This document provides an overview of Interstage AR Processing Server.

Intended readers

This document is intended for users who want an overview of Interstage AR Processing Server. Readers of this document are also assumed to have knowledge of:

- Smart devices
- Operating system that will be used with this product

Structure of this document

This document is structured as follows:

Chapter 1 Introduction

Provides an overview of Interstage AR Processing Server, and describes its advantages, features, management workflow, etc.

Chapter 2 Operating environment

Describes the operating environment of Interstage AR Processing Server.

Chapter 3 System configuration

Describes the system configuration of Interstage AR Processing Server.

Glossary

Explains the terms used in this document.

Abbreviations

This manual uses the following abbreviations for the operating systems:

Official name	Abbreviation	
Microsoft Windows Server 2012 R2 Foundation	Windows Server 2012 R2	Windows
Microsoft Windows Server 2012 R2 Standard		
Microsoft Windows Server 2012 R2 Datacenter		
Microsoft Windows Server 2012 Foundation	Windows Server 2012	
Microsoft Windows Server 2012 Standard		
Microsoft Windows Server 2012 Datacenter		
Microsoft Windows Server 2008 R2 Standard	Windows Server 2008 R2	
Microsoft Windows Server 2008 R2 Enterprise		
Microsoft Windows Server 2008 R2 Datacenter		
Microsoft Windows Server 2008 R2 Foundation		
Windows 8.1	Windows 8.1	
Windows 8.1 Pro		
Windows 8.1 Enterprise		
Windows 8	Windows 8	
Windows 8 Pro		
Windows 8 Enterprise		
Red Hat Enterprise Linux 6 (for Intel64)	RHEL 6	Linux

Official name	Abbreviation	
Red Hat Enterprise Linux 7 (for Intel64)	RHEL 7	

Notations

In this manual, text that must be replaced by the user is denoted in *italicsWithMixedCase* (for example, *installDir*).

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Contents

Chapter 1 Introduction

This chapter provides an overview of Interstage AR Processing Server and describes its advantages, features, workflow, etc.

1.1 Outline

Interstage AR Processing Server is an AR integrated platform product that utilizes AR (Augmented Reality) to transform on-site operations.

By using a smart device, it is possible to perform tasks such as overlaying the information required by the system user on real objects, or adding information such as measurement data or information acquired by operators using simple operations in the field. Interstage AR Processing Server uses Fujitsu's own unique AR markers or other recognition methods to build, develop, and operate the AR system.

1.1.1 Overlay

Interstage AR Processing Server uses AR markers and recognition information, such as Location Data, to identify targets and display overlay information (hereafter referred to as "overlay") on top of real objects.

Figure 1.1 Example of an overlay using AR marker

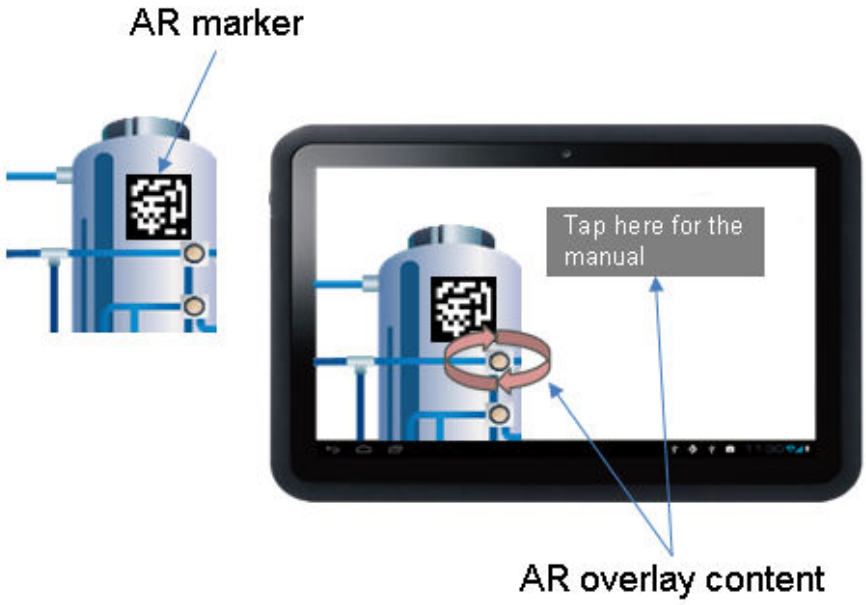


Figure 1.2 Example of an overlay using Location Data

Figure 1.3 Example of an overlay using beacon

AR marker

Interstage AR Processing Server identifies AR marker IDs and the positioning of AR markers and smart devices, and displays overlays by using the camera to recognize images called AR markers. An AR marker is composed of the marker body, which is enclosed by a black frame and white margin.

Barcode

AR overlay content is superimposed on a camera image by using barcodes and QR codes recognized by using the camera.

Location data

AR overlay content is superimposed on a camera image by using latitude, longitude, and altitude information obtained via GPS, Wi-Fi, mobile network or other means.

Beacon

AR overlay content is superimposed on a camera image once the target is recognized using Bluetooth Low Energy (short-distance wireless technology with low energy consumption).

AR overlay content

AR overlay content (images, text and other content) is superimposed on real objects on a camera image when a smart device is pointed towards an AR marker or position for which content was created.

Point

You can use a combination of recognition methods.

1.1.2 Scenarios, scenes and AR overlay definitions

In Interstage AR Processing Server, scenarios and scenes are used for managing AR overlay definitions in order to display overlays according to the job content or situation.

- Scenario
  Interstage AR Processing Server uses scenarios to manage AR overlay definitions for displaying different content depending on the job content and system user even when multiple identical markers are posted at the same location. A scenario consists of multiple scenes.

  Example

  Example of scenarios

  - The content of daytime and nighttime inspections is different, even within the same facility
    - Scenario 1: Daytime inspection
    - Scenario 2: Nighttime inspection
  - The information to be shown for each job is different, even within the same facility
    - Scenario 1: Operation
    - Scenario 2: Parts replacement

- Scene
  Interstage AR Processing Server scenes are analogous to "steps", and are comprised of AR overlay definitions displayed in the same scenario. A scene consists of multiple AR overlay definitions.

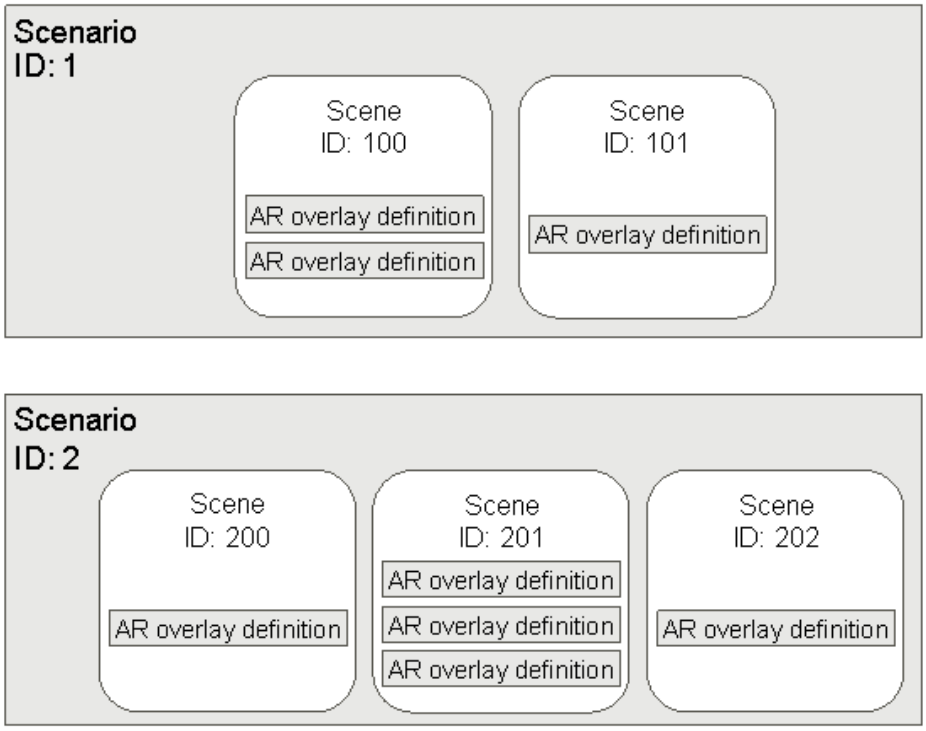
  Example

  Example of scenes used in a plumbing parts replacement operation:

  - Scene 1: Checking the sensor information and verifying that the water has stopped running
  - Scene 2: Opening the cover
  - Scene 3: Replacing parts

- AR overlay definition
  Information related to recognition information for displaying overlays. Definition information such as which AR overlay content is displayed for the recognized target, and the size and rotation of display.

Figure 1.4 Example of the relationship between scenarios, scenes and AR overlay definitions



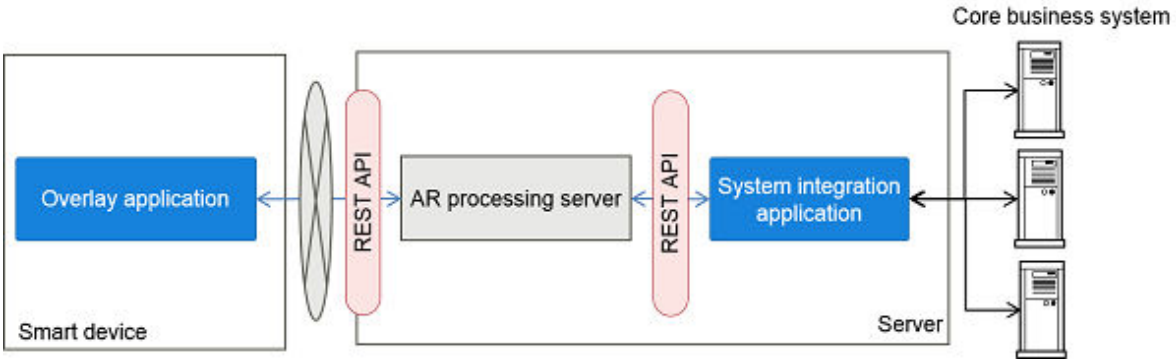
Point

- IDs must be allocated for scenarios and scenes.
- The transition order between scenes should be implemented in applications according to operation content.

1.1.3 Applications

If using Interstage AR Processing Server, the following applications must be developed as required.

Figure 1.5 Application

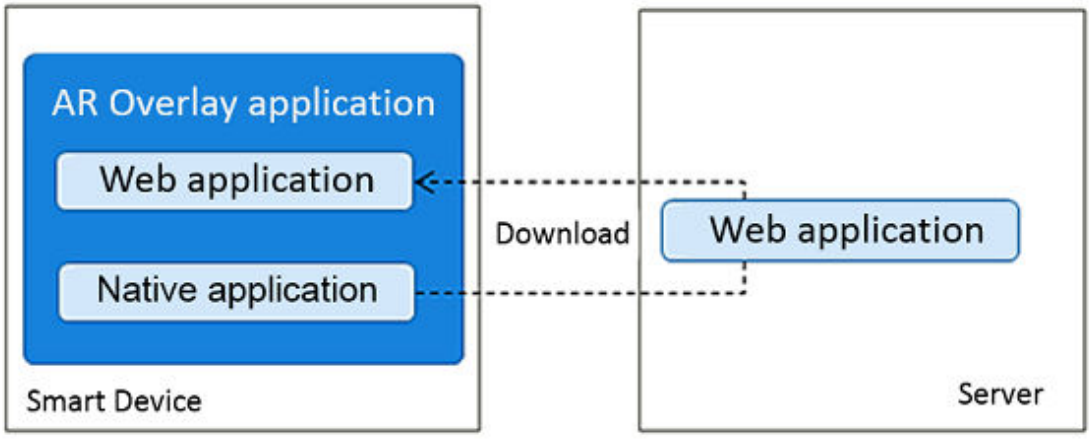


Overlay application

An application that uses AR technology to overlay content on images captured by the camera on smart devices such as smartphones and tablets. Overlay applications run on smart devices.

Overlay applications comprise native applications (which run on smart devices) and web applications. Implementing business logic in a web application enables the application to be coded independently of the device.

Figure 1.6 Overlay application



- Web application (web development languages such as HTML and JavaScript libraries)
  An application developed using development languages such as HTML and JavaScript libraries. These applications are downloaded from the server to a smart device and run on the native application of the smart device.
- Native application (smart device development language such as Android)
  An application developed using development languages supplied by operating systems or accompanying SDK such as Android, and that runs on smart devices. These applications run natively on the smart device's operating system.

System integration application

A development application that performs overlaying of back-end data on front-end smart devices, and reflects data entered into a front-end smart device to the back-end system, by integrating with existing systems such as core business systems built in a back office. System integration applications run on servers.

1.2 Advantages

This section explains the main advantages provided by Interstage AR Processing Server.

1.2.1 Ability to use different recognition modes

You can overlay AR overlay content using different recognition modes, such as the AR marker and position pointed at by the smart device. This allows the developer to use the recognition method most appropriate for each job. For example, position information can be used for giving road directions in a vast site, or an AR marker for giving detailed work instructions at a particular location.

- AR marker

  Suitable when precision is required for positioning the overlay. More specifically, this method suits cases in which instructions must be overlaid on a real-world object, such as during an equipment inspection - it is not suitable for large objects in the distance or a site itself.

- Barcode

  Suitable when you want to use existing barcode information. However, it is not suitable when precision is required for positioning the overlay, nor suitable for situations requiring recognition of distant objects or simultaneous recognition of barcodes. In such situations, you should use an AR marker.

- Location Data

  Suitable for overlaying on distant objects outdoors. More specifically, this method suits cases in which a description of a particular location must be overlaid - it is not suitable for indoor environments or for locations close to the user (50 m or less).

- Beacon

Suitable for position detection in indoor environments. More specifically, this mode is suitable for situations requiring detection of entry to/exit from a particular floor, and tracking of how much time is spent in a given area. However, it is not suitable for use in a vast site where the beacon's radio field is out of reach. A beacon's radio field intensity is weakened by obstacles and shielding. In such situations, it is necessary to install multiple beacons. Ask your beacon provider for details on the device installation environment.

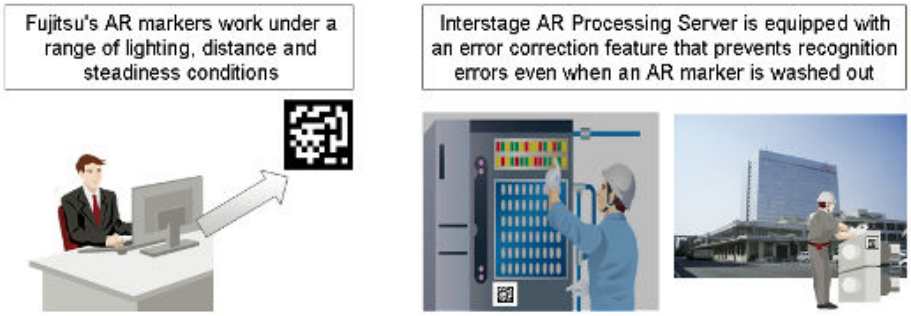
1.2.2 High recognition accuracy, allowing markers to be used under a variety of sub-optimal conditions

Interstage AR Processing Server identifies assets by recognizing AR markers.

Fujitsu's own AR markers (patent pending) are employed to achieve recognition accuracy that withstands use in the field, even at sites located outdoors or in dark places, by working under a range of lighting, distance and steadiness conditions.

Interstage AR Processing Server is equipped with an error correction feature that prevents recognition errors even in cases such as wash out that can occur when used in direct sunlight.

Figure 1.7 Advantages of AR markers

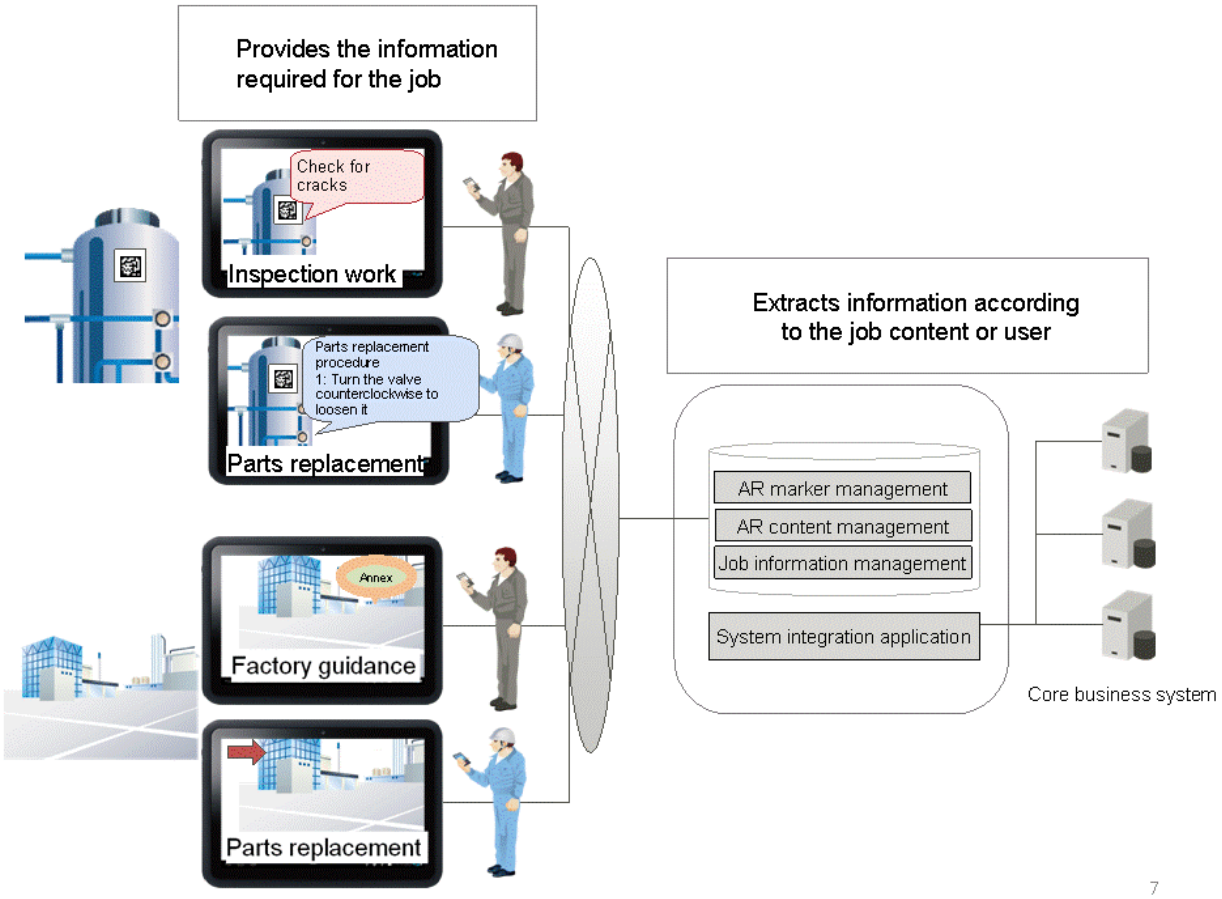


1.2.3 Acquisition of the most appropriate information when pointing a smart device, according to the situation

Pointing a smart device towards the recognition target using recognition information enables acquisition of situation-based content such as the job content or procedure. For example, manuals are displayed for maintenance personnel and the measurement data input fields are displayed for inspection personnel, enabling them to use information depending on the site situation.

The displayed content can change according to the work or user, even for the same recognition information, by managing displayed content or business information centrally on the server. Moreover, the required information can be acquired even when the work site is offline, by caching the content on the smart device.

Figure 1.8 Acquisition of the most appropriate information according to the situation

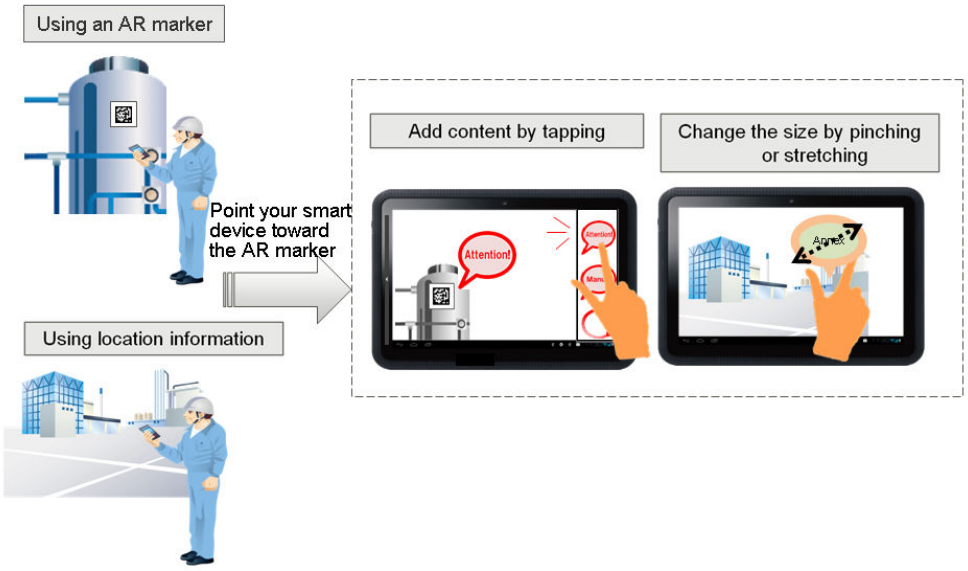


1.2.4 Intuitive operation and easy AR overlay content creation through smart authoring

Text, handwritten memos, drawings, photos and data such as information acquired on-site and notes can be linked to recognition information, and registered as AR overlay content. Sharing information from the field is aimed at preventing human error and achieving more stable quality. Anyone can easily create AR content, by aligning with the position of images captured by the camera on a smartphone or tablet, using intuitive operations such as dragging and pinching or stretching.

AR overlay content can also be displayed in an offline environment by caching it in the smart device. Moreover, managing AR overlay content on a server enables the displayed content to be switched according to work content or user.

Figure 1.9 Smart authoring



1.3 Features

This section explains the main features provided by Interstage AR Processing Server.

Note

The new features provided in each AR upgrade for overlaying AR overlay content are shown below.

AR version	New features
V1.1.1	Overlay using Location Data
	3D model overlays
	Overlay using barcode
	Overlay using beacon

1.3.1 AR markers and AR content overlaying

AR overlay content (such as characters, images, and 3D models) is superimposed on real-world objects when the smart device recognizes the relevant target.

Figure 1.10 Using AR markers

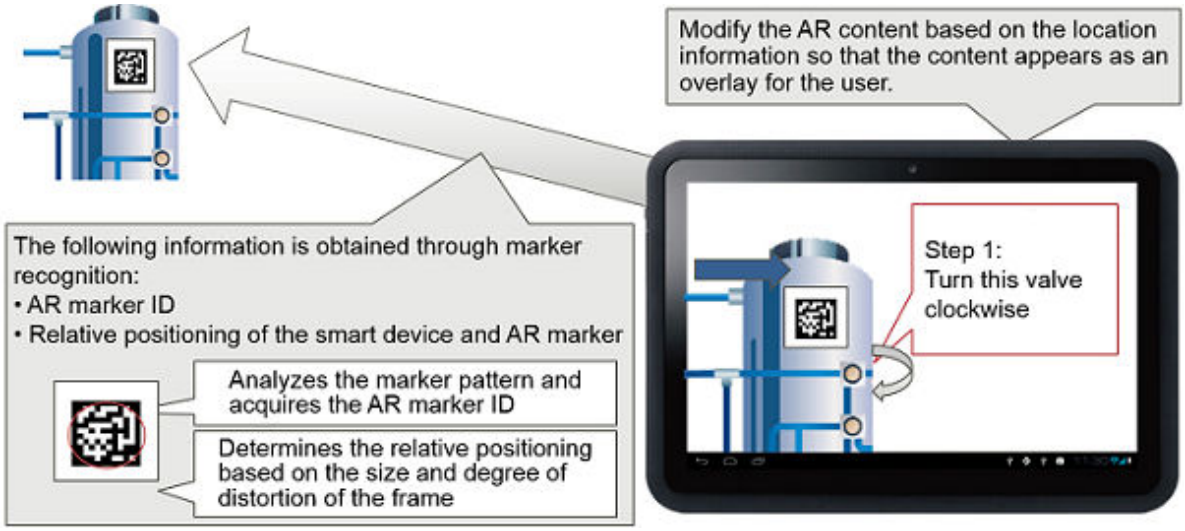
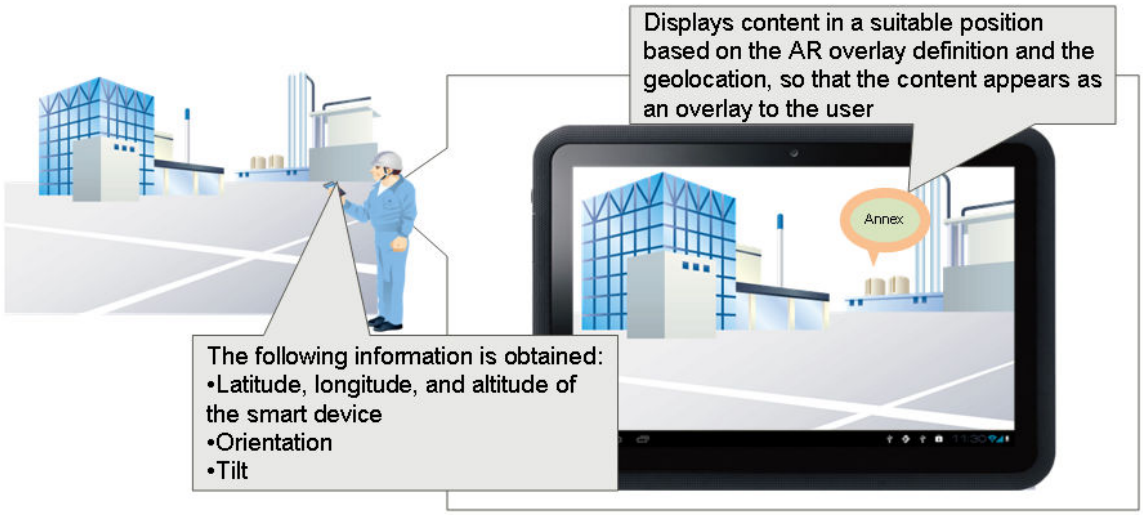


Figure 1.11 Using Location data



Recognition mode

Recognizing AR markers

AR marker with a specific graphic pattern on images captured by the camera on a smart device or tablet is recognized, and the position of the smart device relative to the AR marker is measured.

Recognizing barcodes

A barcode in an image captured by the camera is recognized, revealing its code information, and the position of the smart device relative to the barcode is measured.

Recognizing Location data

Location data(latitude, longitude, altitude) as well as the orientation and tilt of smartphones and tablets can be recognized.

Recognizing beacons

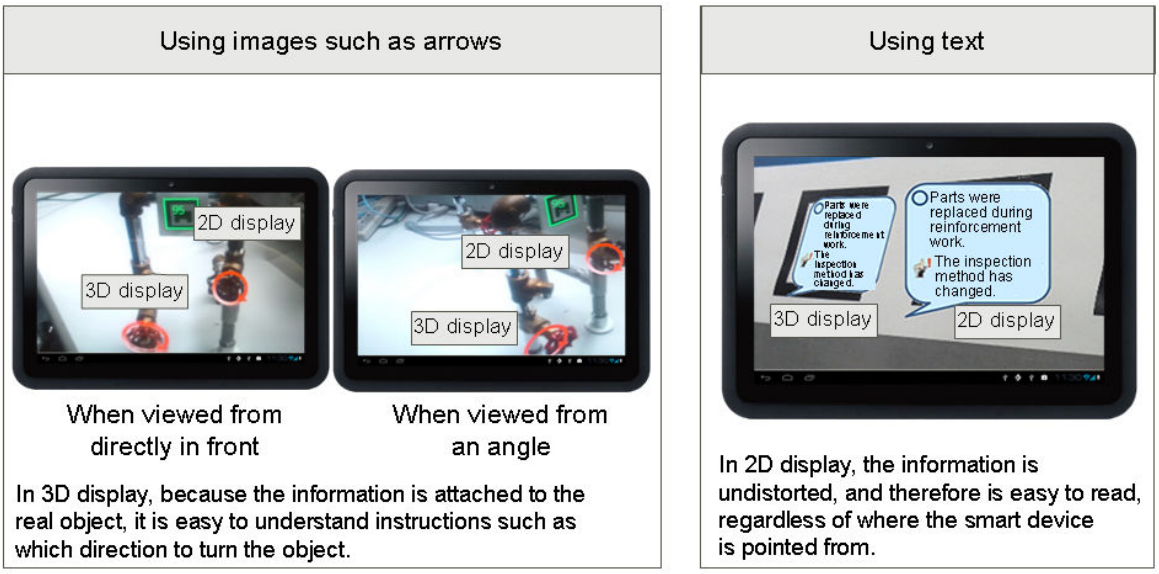
The UUID of the beacon is recognized.

AR markers and AR content overlaying

AR overlay content is superimposed at a suitable position on camera images based on AR overlay definitions and the measured position from the recognition information. Multiple AR overlay definitions can be linked to a single AR marker, and overlays can be displayed simultaneously for multiple recognition methods. Combination of recognition methods can be used for overlay to suit the job.

Displaying AR overlay content in 2D/3D

The overlay is displayed in 2D d (whereby AR content is always displayed at the same angle and size regardless of the orientation of recognition target), or 3D (whereby the AR content appears to be affixed to a particular location). In 2D, this feature enables text information for procedures or other document to be read from any angle without being distorted, and in 3D, it enables navigation elements (such as arrows) to be displayed accurately, regardless of the angle they are viewed from.



Note

- 3D models can be displayed only in 3D.
- If the recognition mode is "Beacon", overlay content can be displayed only in 2D.

Fujitsu's AR markers

Interstage AR Processing Server employs Fujitsu's own AR markers, to enable recognition even from long distances and in dark or dirty environments for carrying out tasks such as maintenance and inspections. Moreover, this product achieves recognition accuracy that can withstand use in the field. The size of AR markers can be adjusted to match the marker affixing location.

1.3.2 Management of AR overlay content according to the situation

Information related to AR markers, AR overlay content, and jobs is centrally managed in the server. This feature facilitates presentation of situation-based content, such as job content, operating conditions and history.

Management of AR markers

The physical location and usage state of AR markers provided by Interstage AR Processing Server can be managed in the server. AR markers can also be downloaded.

Scenario and scene control

The overlay content (scenario and scene) can be changed even for the same AR marker and position, depending on the situation - for example, the overlay content may differ according to the job content or user.

Tap action

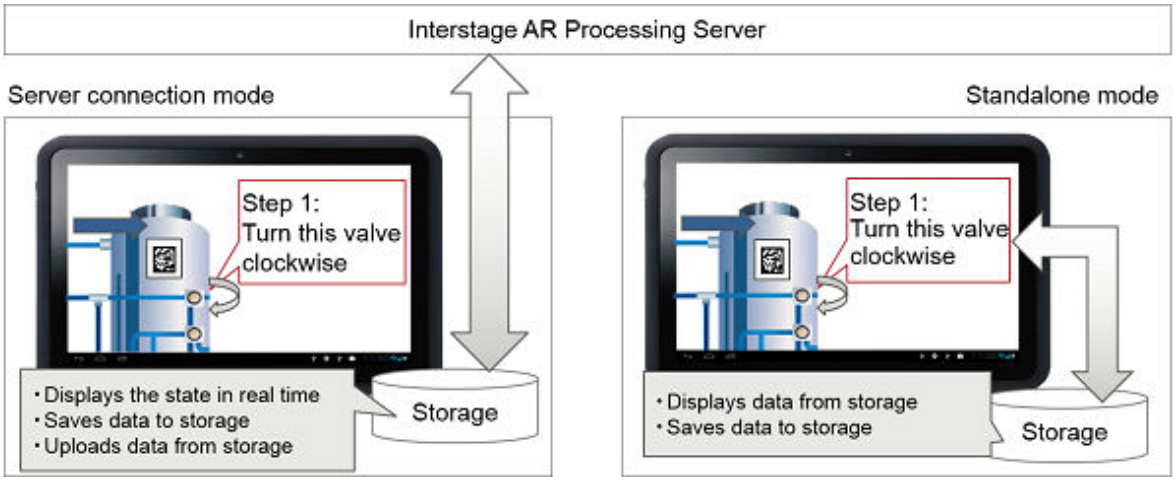
Interstage AR Processing Server provides a tap action feature that can retrieve a file or call a method if specific AR overlay content is tapped. For example, after an overlay is performed, it is possible to perform actions such as displaying a manual by tapping AR content as needed.

Management of operation information linked to recognition information

Information required for operations can be linked to recognition information, and managed accordingly.

1.3.3 Server connection mode and standalone mode

Because AR can be used even in locations where there is no communication environment such as a public line or wireless LAN, it is possible to switch between server connection mode and standalone mode according to the network environment. In server connection mode, communication and synchronization with the server is performed online, and data is saved on the smart device side. In standalone mode, data saved to the smart device can be used.



1.3.4 AR overlay content creation

The user can create, either on the server or on the smart device, content definitions that specify what kind of information is displayed, where, and in which scenario, in which scene, and for what AR marker.

Server authoring using a data management console

Authoring can be performed in a browser using a data management console.

Client authoring using a client authoring tool

Authoring can be performed in a smart device using a client authoring tool.

1.3.5 Resources provided for application developers

Interstage AR Processing Server provides features necessary for the development of overlay applications that use AR technology, and system integration applications that integrate with existing systems, such as core business systems.

Overlay applications include web applications (which are developed using web development languages such as HTML and JavaScript libraries), and native applications (which are developed using smart device development languages).

Overlay application

The following features, required for developing overlay applications that run on smart devices and that display information received from the server, are provided (refer to the *Developer's Guide* for details):

- JavaScript library
- REST API
- Development project
  - Eclipse project files
  - Xcode project files
  - Visual Studio project files
- Sample application (web application)

System integration application

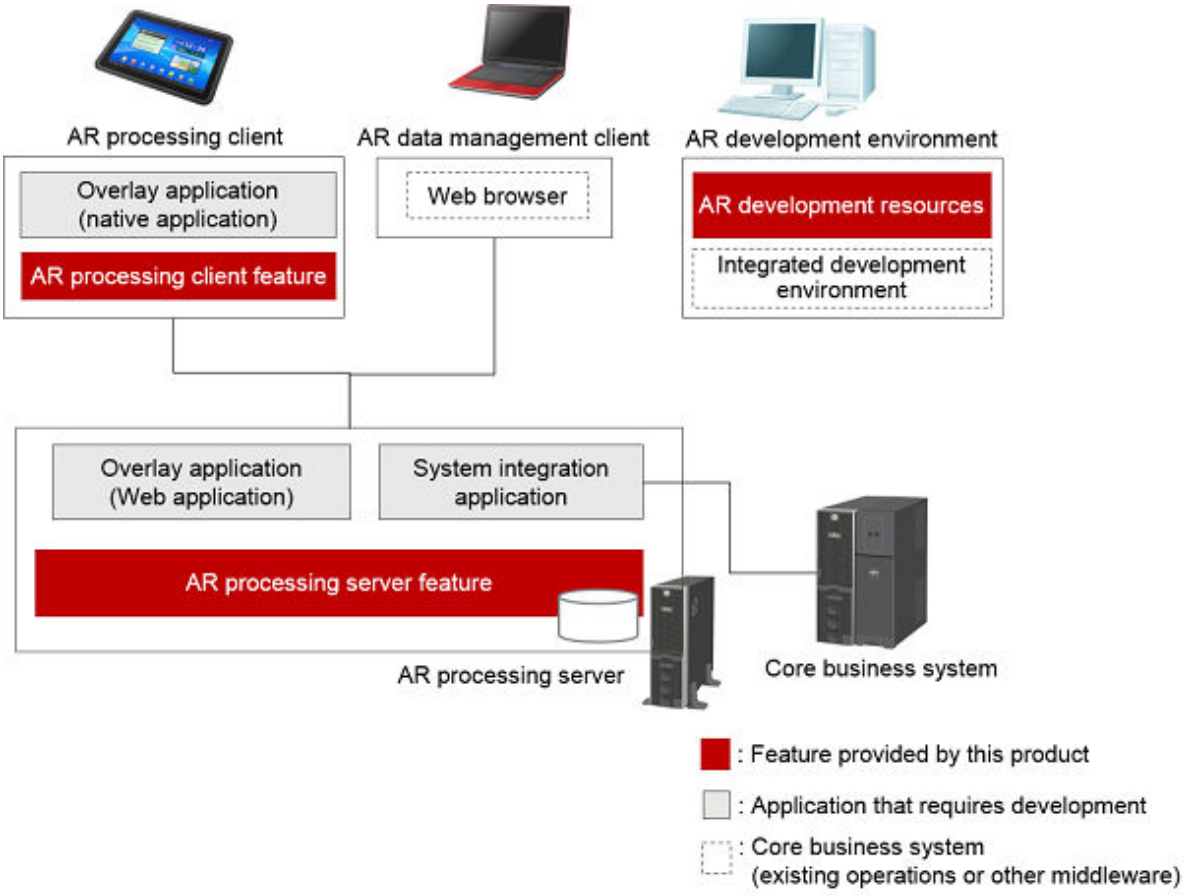
The following feature for managing context (registering, getting or removing AR overlay definitions, etc.), required for building business applications that integrate with external data of the core business, for example, is provided:

- REST API

1.4 Configuration of Interstage AR Processing Server

This section explains the basic configuration of Interstage AR Processing Server.

Figure 1.12 Basic configuration of Interstage AR Processing Server



AR processing client

AR software that runs on smart devices, performing image recognition for AR markers, AR overlay content display, communication with the server, data cache management and log management.

AR processing server

Runs the REST API and perfroms centralized management of ICT information related to AR markers and superimposed on real-world information. AR processing servers also manage the system operation of Interstage AR Processing Server, such as starting and stopping an AR processing server, deploying applications and backing up data.

AR development environment

An environment for developing applications, using AR development resources supplied to system developers.

AR data management client

Performs data management tasks for Interstage AR Processing Server, such as downloading AR markers, creating scenarios and managing AR content.

1.5 Workflow

This section describes the workflow for Interstage AR Processing Server.

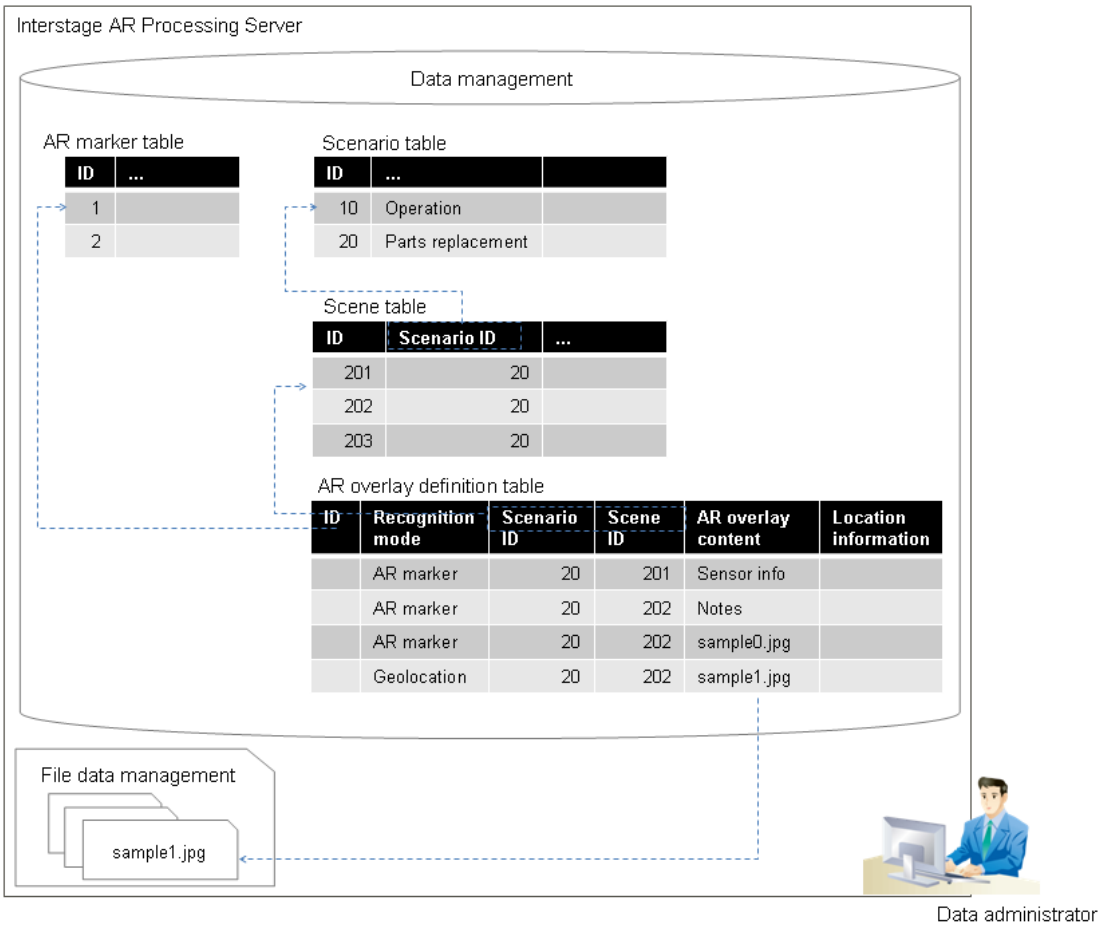
1.5.1 AR data management (including server authoring)

This section describes the workflow management of AR markers, scenarios and scenes from an AR data management client, and for server authoring. The data management console is accessed from a browser on the AR data management client, and information is stored on the server running Interstage AR Processing Server.

The basic workflow for AR data management is as follows:

1. Log in to the data management console.
2. Create scenarios and scenes according to the requirements.
3. Register files that are to be used for AR overlay content and tap actions to the server.
4. Use server authoring to create AR overlay definitions.

Figure 1.13 Example of basic workflow for AR data management



Data management

Manages information for AR markers, scenarios, scenes, and AR overlay definitions.

AR marker table

Table for managing AR marker information (such as AR marker state and location) on the server running Interstage AR Processing Server.

Example

Table 1.1 Example of an AR marker table

AR marker ID	Location	...
1	Building A, Floor 2, Room 201	

AR marker ID	Location	...
2	Building A, Floor 2, Room 201	
3		

Scenario table

Table for managing scenario information (such as scenario ID and name, and registration datetime) on the server running Interstage AR Processing Server.

 Example

Table 1.2 Example of a scenario table

Scenario ID	Scenario name	...
10	Operation	
20	Parts replacement	

Scene table

Table for managing scene information (such as scene ID and name, parent scenario ID, and registration datetime) on the server running Interstage AR Processing Server.

 Example

Table 1.3 Example of a scene table

Scene ID	Scenario ID	Scene name	...
201	20	Parts replacement procedure 1	
202	20	Parts replacement procedure 2	

AR overlay definition table

Table that stores overlay definition information (such as AR marker ID, scenario ID, scene ID, content and deployment information).

 Example

Table 1.4 Example of an AR overlay definition table

ID	Recognition mode	Scenario ID	Scene ID	AR overlay content	Position
1	AR marker	20	201	"Sensor information"	
2	AR marker	20	202	"Note"	
3	AR marker	20	202	"sample0.jpg"	
4	Location Data	20	202	"sample1.jpg"	

File data management

Registers and manages files such as image files and 3D model files used in AR overlay content, and PDF files called by a tap action.

1.5.2 Client authoring

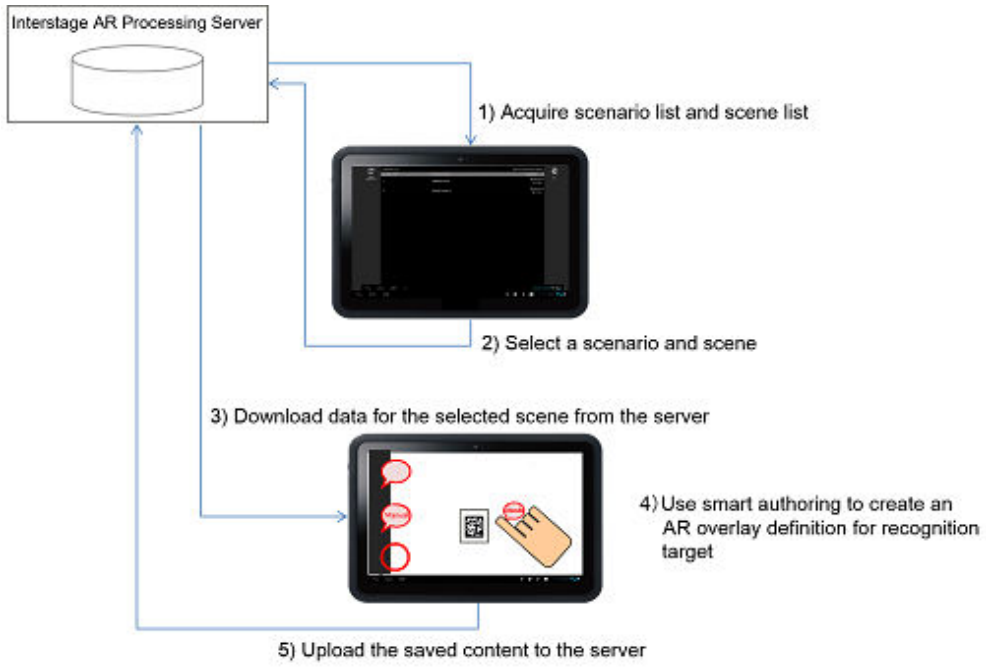
This section describes the workflow for client authoring. In client authoring, AR overlay definitions can be created intuitively for the selected scene.

The basic workflow for client authoring is as follows:

1. Launch the client authoring tool on a smart device, and acquire the scenario list and scene list that have been defined.

2. From the list, select scenarios and scenes to add content to.
3. Download the data for the selected scenes from the server.
4. Hold the smart device up and define information such as text and images for the recognized target.
5. Save the defined content, and upload it to the server.

Figure 1.14 Example of a basic workflow for client authoring



Point

- It is necessary to create scenarios and scenes from the AR data management client prior to performing client authoring.
- AR overlay definitions defined using server authoring can be edited via client authoring.

Chapter 2 Operating environment

This chapter provides information about the operating environment of Interstage AR Processing Server.

2.1 AR processing server

This section provides information about the operating environment of the AR processing servers that Interstage AR Processing Server runs on.

2.1.1 Hardware environment

This section lists the hardware resources required for Interstage AR Processing Server.

Recommended hardware resources

Hardware type	Conditions
CPU	- Minimum: Intel(R) Xeon(R) Processor 2 GHz, 2 cores, 2 or more CPUs - Recommended: Intel(R) Xeon(R) Processor 3 GHz, 4 cores, 2 or more CPUs
Memory capacity (not including the operating system)	- Minimum: 3GB or higher - Recommended: 4 GB or higher

Static disk capacity

The disk capacity required for installation is as follows:

W

Table 2.1 Windows

Installation directory	Disk capacity required for installation
Interstage AR Processing Server installation directory	800 MB
System drive	300 MB
Total	1.1 GB

L

Table 2.2 Linux

Installation directory	Disk capacity required for installation
/opt	640 MB
/etc	10 MB
/var	350 MB
Total	1.0 GB

Dynamic disk capacity

The following disk capacity is required over and above the static disk capacity when running Interstage AR Processing Server.

W

Table 2.3 Windows

Item	Installation directory	Required disk capacity
Data management	*installDir*\fjsvpgs_data	*numberOfRecords* x 0.01 MB + (100 MB) (*1) *1: Required for marker table
File data management	*installDir*\arsvfdm_data	*avgFileSize* x *maxNumberOfFiles* + 1 GB

L

Table 2.4 Linux

Item	Installation directory	Required disk capacity
Data management	/var/opt/FJSVar/fjsvpgs_data	*numberOfRecords* x 0.01 MB + (100 MB) (*1) *1: Required for marker table
File data management	/var/opt/FJSVar/arsvfdm_data	*avgFileSize* x *maxNumberOfFiles* + 1 GB

Example

- Example calculation of disk capacity required for data
  - Scenarios: 10, with 100 scenes per scenario, 30 AR overlay content items per scene
    10 scenarios x 100 scenes x 30 overlay definitions = 30000 records,
    3000 records x 0.01 MB = approximately 300 MB, therefore,
    Total: 300 MB + 100 MB = 400 MB
  - Scenarios: 10, with 100 scenes per scenario, 100 AR overlay content items per scene
    10 scenarios x 100 scenes x 100 overlay definitions = 100000 records,
    10000 records x 0.01 MB = approximately 1GB, therefore,
    Total: 1GB + 100 MB = 1.1GB
- Example calculation of disk capacity required for file system
  - If the file average size = 1 MB,
    1 MB x 500 files = 500 MB
    Total: 500 MB + 1 GB = 1.5 GB

Note

Files cannot be added or updated if the available disk capacity is less than 1GB for the partition containing the specified file system. Ensure to secure sufficient capacity.

2.1.2 Software environment

This section lists the software resources required for Interstage AR Processing Server.

Operating systems

One of the following operating systems is required if using the AR server feature:

- Microsoft Windows Server 2012 R2 Datacenter
- Microsoft Windows Server 2012 R2 Standard
- Microsoft Windows Server 2012 R2 Foundation
- Microsoft Windows Server 2012 Datacenter
- Microsoft Windows Server 2012 Standard
- Microsoft Windows Server 2012 Foundation
- Microsoft Windows Server 2008 R2 Datacenter
- Microsoft Windows Server 2008 R2 Standard
- Microsoft Windows Server 2008 R2 Enterprise
- Microsoft Windows Server 2008 R2 Foundation

- Red Hat Enterprise Linux 6(for Intel64)
- Red Hat Enterprise Linux 7(for Intel64)

Note

Interstage AR Processing Server does not support the Server Core feature.

Required software

The required software depends on the system configuration for Interstage AR Processing Server. Chapter 3 System configurationRefer to "Chapter 3 System configuration" for details.

For Model A (small-scale entry models used in an intranet environment):

The following software is required if using Basic authentication settings or issuing SSL server certificates:

- Interstage Application Server V11 or later

For Model B (small-scale entry models used in an Internet environment):

- Interstage Application Server V11 or later
- Load balancer

For Model C (medium- to large-scale, high reliability, high availability models used in an intranet environment):

- Interstage Application Server V11
- Symfoware Server Standard Edition V12
- Load balancer

For Model D (medium- to large-scale, high reliability, high availability models used in an Internet environment):

- Interstage Application Server V11
- Symfoware Server Standard Edition V12
- Load balancer

Conflicting software

W

You cannot install Interstage AR Processing Server in Windows if the following software is installed:

- Domain controller

L

Required packages

L

The following packages are required if using Red Hat Enterprise Linux 6 (for Intel64):

Package	Architecture
alsa-lib	i686
audit-libs	i686
cpp	x86_64
cracklib	i686
elfutils-libelf	i686
expat	i686
gcc	x86_64
gcc-c++	x86_64
glibc	i686
glibc-devel	i686
glibc-headers	x86_64
kernel-headers	x86_64
libgcc	i686
libICE	i686
libselinux	i686
libSM	i686
libstdc++	i686
libstdc++-devel	x86_64
libtool-ltdl	i686
libuuid	i686

Package	Architecture
libX11	i686
libX11-common	noarch
libXau	i686
libxcb	i686
libXext	i686
libXi	i686
libXp	i686
libXrender	i686
libXt	i686
libXtst	i686
lksctp-tools	i686
mpfr	x86_64
ncurses-libs	i686
nss-softokn-freebl	i686
pam	i686
perl	x86_64
perl-libs	x86_64
perl-Module-Pluggable	noarch
perl-Pod-Escapes	noarch
perl-Pod-Simple	noarch
perl-version	x86_64
readline	i686
redhat-lsb	x86_64
tcsh	x86_64
unixODBC	i686
zlib	i686

L

```
The following packages are required if using Red Hat Enterprise Linux 7 (for Intel64):
```

Package	Architecture
cpp	x86_64
gcc	x86_64
gcc-c++	x86_64
gdb	x86_64
glibc	i686
glibc-devel	x86_64
glibc-headers	x86_64
kernel-headers	x86_64
libICE	x86_64
libSM	x86_64
libstdc++-devel	x86_64

Package	Architecture
libtool-ltdl	x86_64
libX11	x86_64
libX11-common	noarch
libXau	x86_64
libxcb	x86_64
libXext	x86_64
libXi	x86_64
libXp	x86_64
libXrender	x86_64
libXt	x86_64
libXtst	x86_64
lksctp-tools	x86_64
mpfr	x86_64
perl	x86_64
perl-libs	x86_64
perl-Module-Pluggable	noarch
perl-Pod-Escapes	noarch
perl-Pod-Simple	noarch
perl-version	x86_64
redhat-lsb	x86_64
strace	x86_64
tcsh	x86_64
unixODBC	x86_64

2.2 AR processing client

This section provides information about the operating environment of smart devices that run an AR processing client.

Note

If a smart device is under high load due to the status of other applications, it may have a slow response. Close the other applications before using the AR processing client.

2.2.1 Hardware environment

This section lists the hardware resources required for smart devices that are to be used with Interstage AR Processing Server.

Recommended hardware resources

The recommended hardware resources for smart devices that are to be used with Interstage AR Processing Server are as follows.

OS	Hardware type	Conditions
Android	Memory capacity	- RAM Minimum: 512 MB, Recommended: 2 GB - ROM Minimum: 8 GB, Recommended: 64 GB

OS	Hardware type	Conditions
	Camera	Out-camera
	Sensor	- GPS - Acceleration - Geomagnetic
	Bluetooth	Must support Bluetooth 4.0
iOS	Memory capacity	- RAM Minimum: 512 MB, Recommended: 2 GB - ROM Minimum: 8 GB, Recommended: 64 GB
	Camera	Out-camera
	Sensor	- GPS - Digital compass
	Bluetooth	Must support Bluetooth 4.0
Windows	Memory capacity	- RAM Minimum: 1 GB (32-bit) or 2 GB (64-bit), Recommended: 2 GB - Hard disk capacity Minimum: 16 GB (32-bit) or 20 GB (64-bit), Recommended: 64 GB
	Camera	- The device must recognize the camera - The camera resolution must support 640 x 480 (VGA)
	Sensor	- GPS - Acceleration - Geomagnetic
	Display	- The display adapter must support Frame Buffer Object (FBO) of OpenGL
	Bluetooth	Must support Bluetooth 4.0

Note

Android 4.3 or later is required to use the beacon recognition mode.

Memory capacity

If performing high load overlays such as using a large volume of image files at once, the memory capacity on the smart device may be insufficient, resulting in the image displaying white. Therefore, ensure to use the following formula to calculate the required memory capacity according to the job content.

Calculation for RAM

Use the following formula to calculate the required memory capacity for the RAM:
ramInBytes = (*verticalSizeOfImgResourcesInScene* x *avgHorizontalSizeInPixels*) x 4 x *numberOfImages*

Example

If 100 1024 x 1024 [pixel] images are set as AR overlay definitions per scene:
Required memory = 1024 x 1024 x 4 x 100 = 400 MB

Calculation for ROM

Use the following formula to calculate the required memory capacity for the ROM to be used in one scenario:

- *romUsedForOneSceneInMb* = *avgResourceFileSizeInMb* x *numberOfFilesInScene*
- *romUsedForOneScenarioInMb* = *avgRomUsedForOneSceneInMb* x *numberOfScenesInOneScenario*

Supported smart devices

The list of supported smart devices will be updated progressively. Refer to the Fujitsu Technology Solutions Partner Extranet and External Collaboration for details:
https://partners.ts.fujitsu.com/

Disk capacity

The disk capacity required for business applications depends on the job content.

Sensor

Various sensors are required for using location data.

2.2.2 Software environment

This section lists the software resources required for smart devices that are to be used with Interstage AR Processing Server.

Operating systems

One of the following operating systems is required:

- Android
- iOS
- Windows

Note

- The list of supported operating systems will be updated progressively. Refer to the Fujitsu Technology Solutions Partner Extranet and External Collaboration for details:
  https://partners.ts.fujitsu.com/

Required software

There is no required software for Interstage AR Processing Server.

Conflicting software

There is no software that conflicts with Interstage AR Processing Server.

2.3 AR development environment

This section provides information about the operating environment for the AR development environment that is to be used for developing applications that run on Interstage AR Processing Server.

2.3.1 Hardware environment

This section lists the hardware resources required for the AR development environment.

Table 2.5 Recommended hardware resources

Hardware type	Conditions
CPU	Recommended: Intel(R) Pentium III 1 GHz or higher
Memory capacity (not including the operating system)	Minimum: 512 MB, Recommended: 2 GB or more

Note

When developing applications using an Android emulator, you must test them in a smart device, since Android emulators do not support testing.

2.3.2 Software environment

This section lists the software resources required for the AR development environment.

Operating systems

One of the following operating systems is required:

- Android
  - Windows 8.1
  - Windows 8.1 Pro
  - Windows 8.1 Enterprise
  - Windows 8
  - Windows 8 Pro
  - Windows 8 Enterprise
  - Windows 7 Home Premium
  - Windows 7 Professional
  - Windows 7 Enterprise
  - Windows 7 Ultimate
- iOS
  - OS X
- Windows
  - Windows 8.1
  - Windows 8.1 Pro
  - Windows 8.1 Enterprise

Required software

The following software is required for developing native applications:

- Android
  - Android SDK
  - Eclipse IDE
  - JDK
  - Android Development Tools (ADT) plug-in
- iOS
  - Xcode
- Windows
  - Visual Studio 2013
    One of the following editions is required:
    1. Professional
    2. Premium
    3. Ultimate

Conflicting software

There is no software that conflicts with Interstage AR Processing Server.

2.4 AR data management client

This section describes the operating environment for AR data management client, which performs data management for Interstage AR Processing Server.

2.4.1 Hardware environment

This section lists the hardware resources required for the AR data management client.

Table 2.6 Recommended hardware resources

Hardware type	Conditions
CPU	Recommended: Intel(R) Pentium III 1 GHz or higher
Memory capacity (not including the operating system)	Minimum: 512 MB, Recommended: 2 GB or more

2.4.2 Software environment

This section lists the software resources required.

Operating systems

One of the following operating systems is required:

- Windows 8.1
- Windows 8.1 Pro
- Windows 8.1 Enterprise
- Windows 8
- Windows 8 Pro
- Windows 8 Enterprise
- Windows 7 Home Premium
- Windows 7 Professional
- Windows 7 Enterprise
- Windows 7 Ultimate
- OS X

Required software

- Windows Internet Explorer 11
- Windows Internet Explorer 10
- Windows Internet Explorer 9

Conflicting software

There is no software that conflicts with Interstage AR Processing Server.

Chapter 3 System configuration

This chapter describes the system configuration of Interstage AR Processing Server. Select a suitable model according to the operating environment and scale. For non-Interstage AR Processing Server products, build the environment as necessary.

3.1 Items for consideration

The following are the main items that need to be considered before installing the system:

- Scope for system users
- Network environment
- Wi-Fi settings for smart devices
- Continuous operating time for smart devices
- Resource size design

Caution using in the virtualization environment

- Your system may be vulnerable if you locate a VM for DMZ and one for internal segment on the same physical machine.
- There is some possibility that system data inconsistency occurs when a virtual machine stops, stalls or crashed while uploading files.

3.1.1 Scope for system users

It is necessary to decide on factors such as the number of system users, and the types and number of smart devices to be used for jobs that are to be systemized using Interstage AR Processing Server.

3.1.2 Network environment

Interstage AR Processing Server manages information centrally. This requires communication between the server and smart device. Regarding the network environment, the following items need to be considered in advance:

- Network environment in the field where smart devices are carried
- Available capacity for downloading content from the server
- Timing of server data downloads
- Security between the server and smart device

3.1.3 Wi-Fi settings for smart devices

In Android versions, the operating system specifications do not allow the AR processing client to access the network environment that needs to be connected via a proxy server even if a proxy server is specified in the Wi-Fi settings. In iOS versions, the AR processing client can access the required network environment via a proxy server as the Wi-Fi settings are reflected in the smart device.

3.1.4 Continuous operating time for smart devices

Applications that use Interstage AR Processing Server operate and communicate through the camera. This may result in smart devices having a shorter continuous operating time than that envisaged by smart device manufacturers, even if using a fully charged smart device.

3.1.5 Resource size design

Due to the significant time it takes to download large resource files (PDF, video, etc.) from the server, it is recommended to perform operations using local data on smart devices, such as downloading in standalone mode or server connection mode in advance.

3.2 Example configuration patterns

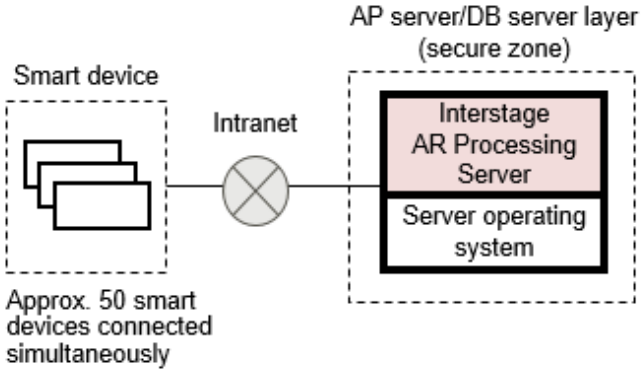
Factors such as the operating environment, the number of simultaneous connections by users, the volume of context that is handled, and security, are to be taken into consideration when deciding the required configuration. The following configurations are envisaged for Interstage AR Processing Server:

- Model A: Small-scale entry model used in an intranet environment (all-in-one minimum configuration)
- Model B: Small-scale entry model used in an Internet environment (web servers deployed in DMZ)
- Model C: Medium- to large-scale, high reliability, high availability model used in an intranet environment (multiple-server configuration)
- Model D: Medium- to large-scale, high reliability, high availability model used in an Internet environment (in addition to above, web servers are deployed in DMZ)

3.2.1 Model A: Small-scale entry model used in an intranet environment

An all-in-one minimum configuration model with a single-server configuration. This configuration is envisaged for 50 or fewer simultaneously connected smart devices.

Figure 3.1 Example of a small-scale entry model used in an intranet environment



Note

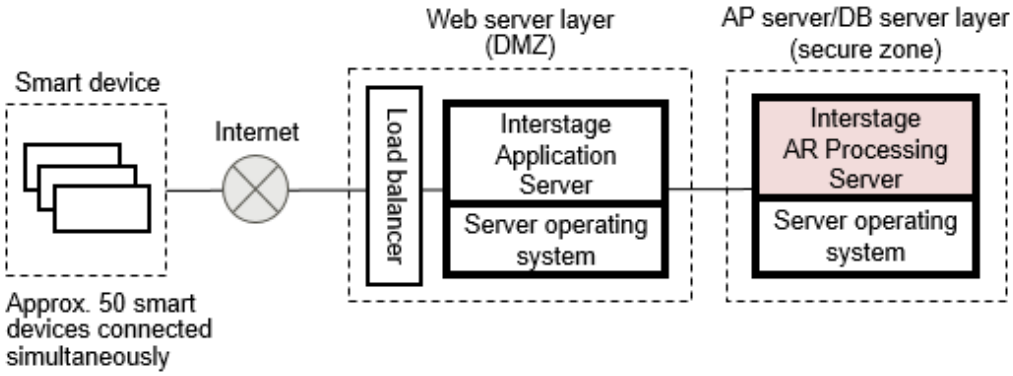
To perform basic authentication settings for model A, install Interstage Application server as a web server in an intranet environment and refer to the method described in the manual for Interstage Application Server.

3.2.2 Model B: Small-scale entry model used in an Internet environment

This configuration is used for downloading overlay applications or using the data management console via a web server deployed in DMZ. This configuration is envisaged for use in standard operation. To maintain security, use measures such as basic authentication, SSL encryption, and IPCOM, to protect the IT system from internal and external threats.

This configuration is envisaged for 50 or fewer simultaneously connected smart devices.

Figure 3.2 Example of a small-scale entry model used in an Internet environment



Note

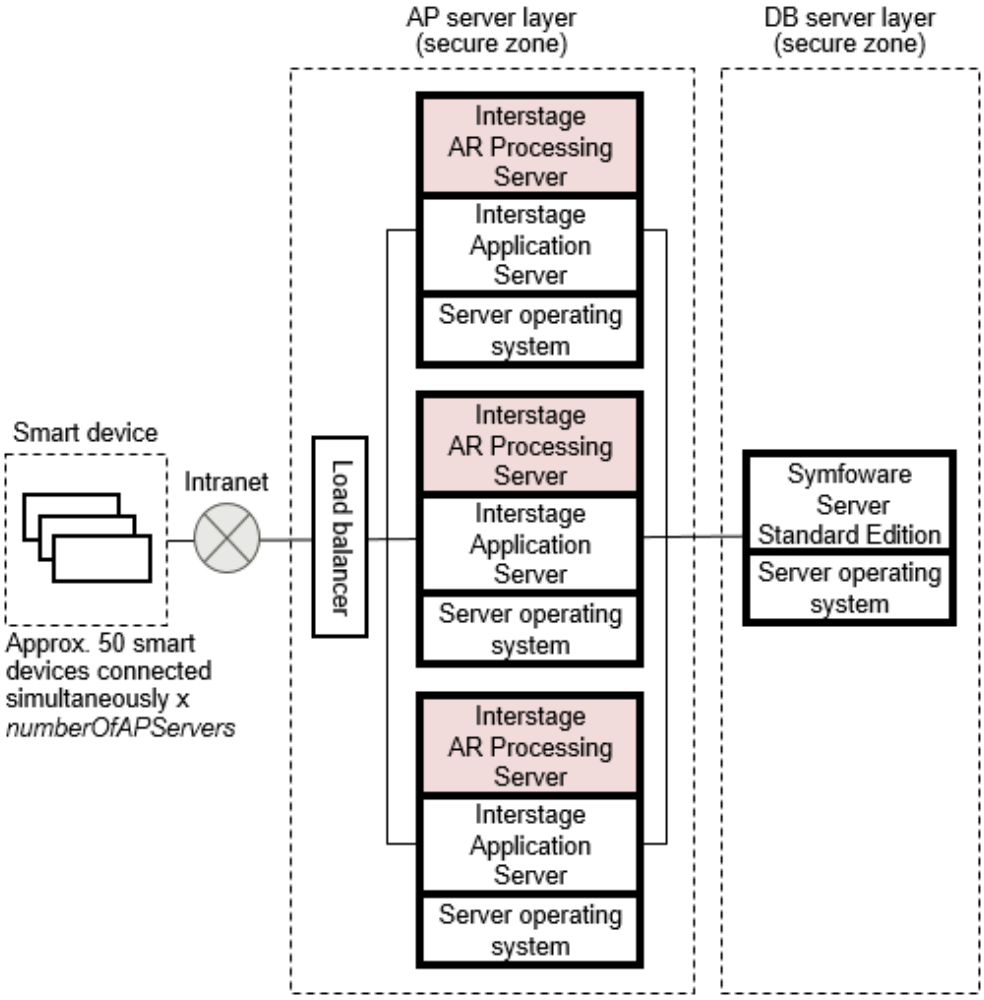
Communication between the web server and AP server does not use SSL encryption, even when SSL encryption is enabled.

3.2.3 Model C: Medium- to large-scale, high reliability, high availability model used in an intranet environment

This system configuration is used for realizing high security/scalability in intranet operations, advanced authentication/authorization and user/role management features. For more efficient operations, it is recommended to integrate with Interstage Application Server (hereafter referred to as APS).

This configuration is envisaged for approximately 200 simultaneously connected smart devices.

Figure 3.3 Example of a medium- to large-scale, high reliability, high availability model used in an intranet environment

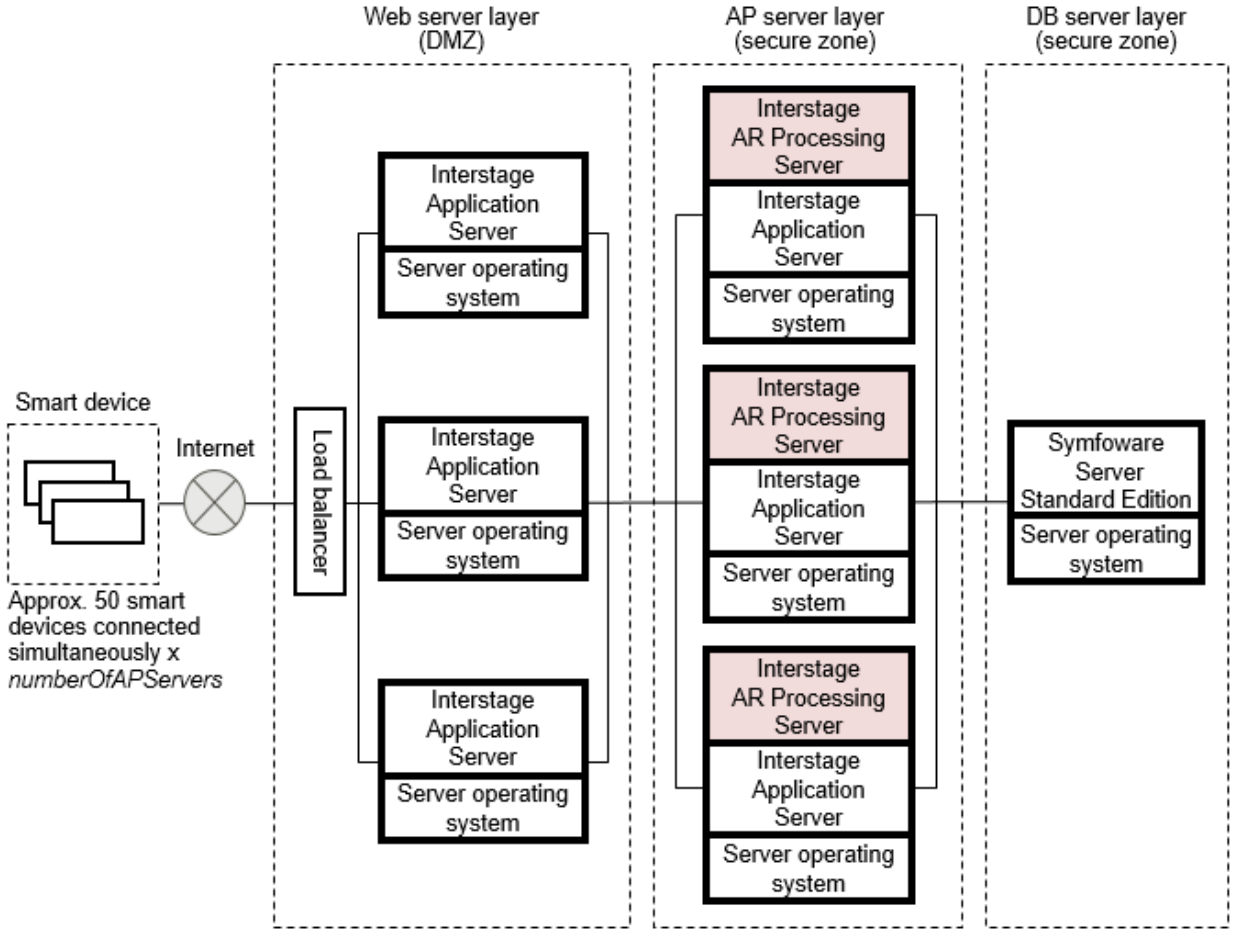


3.2.4 Model D: Medium- to large-scale, high reliability, high availability model used in an Internet environment

This system configuration is used for realizing high security/scalability in Internet operations, advanced authentication/authorization and user/role management features.

This configuration is envisaged for approximately 200 simultaneously connected smart devices.

Figure 3.4 Example of a medium- to large-scale, high reliability, high availability model used in an Internet environment



Glossary

AR (Augmented Reality)

A technology that extends and enhances human awareness by superimposing various digital information (such as characters, images and voice) on real-world information that humans obtain via sight and hearing.

AR development environment

An environment for developing applications, using AR development resources supplied to system developers.

AR development resource

Resource supplied by Interstage AR Processing Server for the purpose of developing applications.

AR processing client

AR software that runs on smart devices, performing image recognition for AR markers, retrieval of position information, AR overlay content display, communication with the server, data cache management and log management.

AR processing server

Runs the REST API and performs centralized management of ICT information related to recognition information and superimposed on real-world information.

Overlay application

An application that uses AR technology to overlay content on the camera preview screen of a smart device.

AR overlay content (AR content)

Images, text and other content displayed when a smart device is held up to a recognition target.

AR overlay definition

Information pre-associated with a recognition target to enable overlaying. This definition information determines which AR overlay content will be displayed at what size and angle on what AR marker (or position information) in what scenario and scene.

AR data management client

Performs data management tasks for Interstage AR Processing Server, such as downloading AR markers, creating scenarios and managing AR content.

AR marker

Image that has a particular pattern called an AR marker. Interstage AR Processing Server identifies AR marker IDs and the positioning of AR markers and smart devices, and displays overlays by using the camera to recognize images called AR markers. An AR marker is composed of the marker body, which is enclosed by a black frame and white margin.

Beacon

A recognition mode in which AR overlay content is superimposed on a camera image once the target is recognized using Bluetooth Low Energy (short-distance wireless technology with low energy consumption).

ID area

An area in the white margin, in which information such as the AR marker ID can be freely entered for identification by system users and data administrators.

Web application

One type of AR overlay application. It is developed using a web development language such as HTML or JavaScript. These applications are downloaded from the server to a smart device and run on the native application of the smart device.

Web layer

Runs and displays web applications on the AR overlay application.

Position information

Information such as latitude, longitude, altitude, orientation, and tilt obtained using a GPS, Wi-Fi, mobile network or other means.

Image texture

An image pasted on AR content.

Authoring

The process of creating an AR overlay definition.

Client authoring

Authoring performed on a smart device using a client authoring tool.

Server authoring

Authoring performed on a browser using the data management console.

Server connection mode

Performs online communication and synchronization with the server and saves data on the smart device side when the smart device is online.

System operation administrator

Performs maintenance tasks, such as installation and setup of Interstage AR Processing Server, and starting or stopping the server.

System developer

Performs design, development and testing of applications that run in Interstage AR Processing Server.

System user

Uses business applications that run in Interstage AR Processing Server.

System integration application

A development application that performs overlaying of back-end data on front-end smart devices, and reflects data entered into a front-end smart device to the back-end system, by integrating with existing systems such as core business systems built in a back office.

Scenario

Consists of multiple scenes (or "steps"). Using a presentation tool as an example, a scenario would be a single file comprising multiple slides.

Scene

Group of AR overlay definitions displayed in the same context. Using a presentation tool as an example, a scene would be a single slide.

Standalone mode

Enables an AR overlay application to be used with data saved in a smart device.

Smart authoring

The process of creating an AR overlay definition intuitively. It is one type of smart technology proposed by Fujitsu.

Tap action

The action of tapping AR content to pass a resource to an external application or to run a script.

Overlay

The action of displaying images and text on real-world objects using a smart device.

Data management console

A console provided by Interstage AR Processing Server for creating scenarios and scenes and performing server authoring and data management such as downloading AR markers. It runs on a browser.

Data administrator

Manages data required for the Interstage AR Processing Server system.

Text texture

Character data pasted on AR content.

texture

A component of AR content that is pasted onto the surface of a polygon. It includes images and text.

Recognition information

Information that can be detected using an AR marker, Location Data, etc., on a smart device. In Interstage AR Processing Server V1.1.1, the following information can be recognized:

- AR marker
- Barcode
- Location Data
- Beacon

Native AR display layer

Displays AR content defined in an AR overlay definition of an AR overlay application.

Native application

A type of AR overlay application that runs as a native application on the operating system of a smart device.

Native camera display layer

A type of layer that renders the image obtained from the camera in an AR overlay application.

Barcode

A recognition mode in which AR overlay content is superimposed on a camera image once a barcode or QR code is recognized using the camera.

Polygon

A component of AR content that makes up the shape of AR content.

Resource

A file stored in an AR processing server or other media cloud and used for tap actions and AR content. A resource used for AR content is called an image texture.

3D model

A data structure for representing three-dimensional objects on a display. In Interstage AR Processing Server, this data structure is made up of polygon information (obj file) and material information (mtl file).