White Paper for

AISWare FlyingServer

AISWare FlyingServer supports Jakarta EE 10 and applications such as WAR, EAR, and JAR in single-machine and cluster environments. It passes ICT innovation tests to be compatible to diversified products in the ecosystem.

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Information System Construction and Service Capability Assessment CS L4

ISO9001 Quality Management System Certificate

ISO20000 IT Service Management System Certificate

ISO27001 Information Security Management System Certificate

Service Certificate of Information System Security Development L2

Service Certificate of Information System Security Integration L2

Awards (Part)

Awards from International Telecommunication Union (ITU)

Award for Science and Technology Progress of Wu Wenjun Awards

Best Network Slicing Trail at 5G World Summit

French Design Awards

Global Telecoms Awards

IDC Future Operation Leadership

iF Design Golden Award of Hannover Industrial Design Forum

Leading Artificial Intelligence Enterprise in China

Leading Enterprise of Advanced Smart City

Outstanding Catalyst Contribution to TM Forum Assets

The Best Innovation and Future Techco of TM Forum

The Best Standard Contributor of TM Forum

The Most Innovative Application of AI & Automation of FutureNet Asia

The Most Influential Enterprise in China Software Industry

Top 100 China Software Business Revenue List for consecutive years

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1 Executive Summary

With intensified global political and economic competition, nations are enhancing the autonomy and security of IT systems. To reduce reliance on foreign technologies, a highly home-grown autonomous IT system has become a key aspect of new infrastructure projects driven by market and policy opportunities. Middleware, as a crucial component of this infrastructure, has long been dominated by foreign commercial and open-source software, creating market potential for domestic alternatives.

AISWare FlyingServer (hereinafter as “FlyingServer” or “FS”) is a web middleware supporting Jakarta EE8 and MicroProfile. It offers seamless integration with both open-source and commercialized middleware. It actively engages with the domestic ICT ecosystem with strategic partners to deliver integrated solutions, which enhances product quality and competitiveness while expanding into vertical sectors.

This White Paper will elaborate the AISWare FlyingServer from several aspects, including product overview, product architecture, features, advantages, and customer value.

2 Abbreviations and Terms

Abbreviations and terms are shown in 0.

Table 2-1 Term Explanation

Abbreviation or Term	Full Name	Explanation
EJB	Enterprise Java Beans	Enterprise Java Beans
Jakarta EE 8	Jakarta Enterprise Edition 8	Enterprise-level distributed application platform standard
MicroProfile	MicroProfile	A set of Java specifications for cloud-native application development
OS	Operating System	The software that manages computer hardware, software resources, and provides common services for computer programs
WAR	Web Application Archive	A file format for Java web applications that can be deployed to a web server or application server
EAR	Enterprise Application Archive	A file format used to package Java EE applications, which can include multiple WARs, JARs, and other resources

Abbreviation or Term	Full Name	Explanation
JAR	Java Archive	A package file format typically used to aggregate Java class files and associated metadata and resources into one file for distribution and deployment
SpringBoot	Spring Boot	An open-source Java-based framework used to create stand-alone, production-grade Spring-based applications that you can "just run".
JBoss	JBoss Application Server	An open-source application server developed by JBoss, now known as WildFly, which is a part of the WildFly family of open-source Java EE application servers
WebLogic	Oracle WebLogic Server	A commercial Java EE application server from Oracle Corporation, used for developing, integrating, deploying, and managing enterprise applications
TongWeb	TongWeb Application Server	A Chinese web application server, similar to Tomcat, used for deploying Java web applications

Abbreviation or Term	Full Name	Explanation
BES	Baidu Easy Server	A Java EE application server, also known as the Baidu Easy Server, developed by Baidu for enterprise applications
Apusic	Apusic Application Server	A Java EE application server developed by Huawei, designed for enterprise application deployment and management
Tomcat	Apache Tomcat	An open-source Java Servlet Container developed by the Apache Software Foundation, used to develop and deploy Java web applications

3 Product Overview

AISWare FlyingServer is an application middleware supporting Jakarta EE8 and MicroProfile for lightweight and enterprise-level Java applications. It includes web, EJB, and microservices containers, highly compatible with major servers, CPUs, OSs, databases, and national encryption algorithms, enhancing enterprise application security. FlyingServer actively contributes to international and domestic standardization by shaping technical specifications and advancing the middleware ecosystem.

3.1 Trends and Challenges

From the current international environment, software with independent intellectual property rights stands to gain significant market and policy opportunities. As one of the core underlying technologies, alongside OSs and databases, potentials are embedded in application middleware.

Market trends show that digital transformation is driving overall demand growth. Many new applications and systems rely on middleware for software support and management. However, middleware is facing several challenges:

- **Competitive**: The middleware market is highly involved with numerous domestic and international players, and suppliers are rivals across regions.
- **Homogenization**: Middleware products are often standardized, and there is limited innovation once specifications are met.
- **Evolving technologies**: Middleware must keep pace with emerging technologies, such as cloud computing and cloud-native microservices. This requires continuous research and development of new features and constant improvements to adapt to a fast-changing landscape.

3.2 Product Definition

AISWare FlyingServer is a home-grown application middleware under international standards. It supports the deployment of WAR, EAR, and JAR and

hosts various enterprise-level Java applications, addressing cross-industry development and deployment needs.

3.3 Product Positioning

Application middleware operates on the OSs and under the application layer, as well as provides important services such as messaging, communicating, data access, and security. FlyingServer is a home-grown middleware solution with full autonomy and control to mitigate the risks of foreign middleware monopolies and secure systems

Without a feature in industry-specific, FlyingServer is a universal product for Java application development and deployment across various sectors.

4 Product Portfolio

AISWare FlyingServer consists of seven main components: Web Console, Command Console, Application Container, Resources, Core Functions, Node Agent, and Auxiliary Functions. It offers a deployment environment for applications along with corresponding monitoring capabilities.

Figure 4-1 Functional Architecture of FlyingServer

5 Basic Functions

5.1 System Management

- Configure accounts for accessing the system or applications;
- Configure resources accessible to visitors;
- Maintain system function menus;
- Configure static system data in files, allowing the addition of options by modifying file content;
- Configure default parameters for all available functions, such as new clusters, nodes, and instances;
- Multilingual display function includes data for pages, interfaces, exceptions, and logs.

5.2 Cluster Management

- Create and delete clusters;
- Create and delete cluster instances;
- Start and stop clusters;
- Balance cluster load.

5.3 Node Management

- Add and delete host nodes;
- Manage FlyingServer status for nodes;
- Monitor host resource usage.

5.4 Instance Management

- Create, modify, and delete instances;
- Start and stop instances;
- Monitor instance runtime.

5.5 Application Management

- Add, modify, and delete applications;
- Deploy applications automatically;
- Start and stop applications;
- Delete and reload applications;
- Monitor data requests and thread usage.

5.6 Resource Management

- Submit asynchronous tasks from applications to a centralized concurrent processor;
- View the JNDI resource list in FlyingServer;
- Establish channels to connect external applications, facilitating the integration of external capabilities into FlyingServer;
- Provide message services for default implementation and integration with third parties;
- Database adapters for connecting to DB2, Microsoft SQL Server, MySQL, Oracle, Sybase, Derby, Inforfix, JavaDB, and Postgresql.

5.7 Microservices Container

- Configure Microservice;
- Collect invocation chain data;
- Check application health;
- Monitor service metrics;
- Service fault tolerance;
- Starter;
- Describe Microservice interface;
- REST client;
- Token propagation;
- Microservice context.

5.8 Web Container

- Support JSP parsing;
- Support Servlet 4.0;
- Support HTTP2;
- Support session data storage in memory, files, and Redis;
- Support JAX-RS 2.0;
- Support JAX-WS 2.2.

5.9 EJB Container

- Support Bean Validation 2.0;
- Support EJB 3.2.

6 Featured Functions

This chapter introduces the key advantages of the FlyingServer. Developed primarily based on international specifications for application middleware, FlyingServer is user-friendly and incorporates the following unique features to meet the demands of the domestic ICT ecosystem.

6.1 Reinforced Security

To meet the security requirements of enterprise-level applications, FlyingServer provides supplementary security reinforcement capabilities for business operations.

Figure 6-1 Security Guard Framework

FlyingServer ensures all-round application security, covering user, access, data, communication, and system security. It supports national encryption (GM) for SSL communication and load-balancing services and provides security through coding standards, request prevention, attack defense, anomaly monitoring, and operation logs.

6.2 Cloud-Native Microservices Development Framework

Based on MicroProfile 4.1 and Jakarta EE, FlyingServer serves as a unified middleware platform for Java application developers. It supports development, packaging, and runtime functions, making it easier for developers to build and manage microservices-based applications.

Figure 6-2 Cloud-Native Microservices Development Framework

Following the MicroProfile, FlyingServer offers a suite of development tools for cloud-native microservices, enabling functions such as balancing, routing, metrics, governance, invocation, gateway, discovery, configuration, and scheduling. These features are utilized via annotations. In addition to specification functions, FlyingServer provides integration capabilities for

development frameworks, such as tool integration, application integration, compilation packaging, Spring compatibility, feature integration, and function integration. FlyingServer is a development framework similar to Spring Boot, but it is more lightweight with fewer dependencies and is more tightly integrated with the cloud.

6.3 Cloud Deployment

FlyingServer leverages Kubernetes and cloud-native technologies to enhance capabilities such as clustering, session communication, and high availability in cloud environments. It ensures a consistent user experience across both cloud and non-cloud environments, allowing existing business applications to migrate to the cloud without modification.

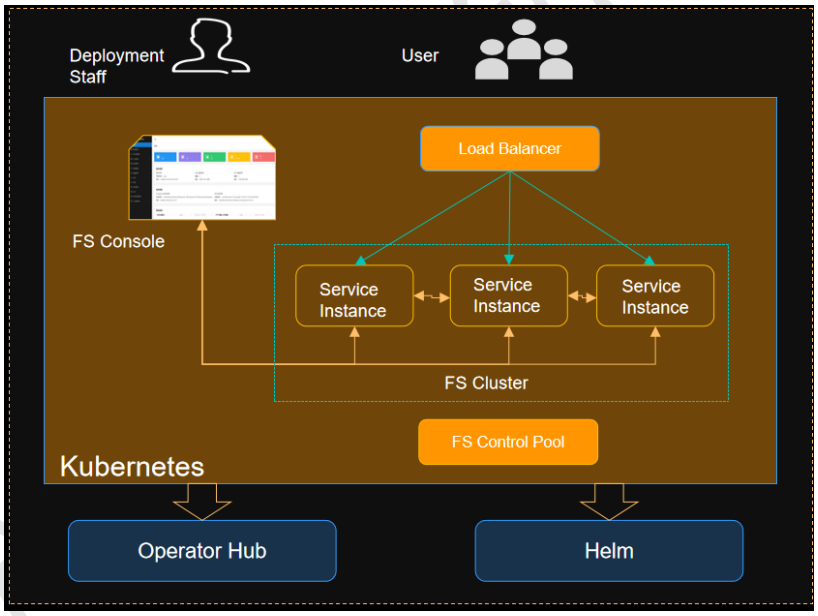

Figure 6-3 Cloud-Native Structure of FlyingServer

FlyingServer provides an Operator image, allowing the creation of FlyingServer clusters through Kubernetes command lines. It communicates with the API Server to ensure scalable instance. Native Java applications can be deployed through the console and command line without packaging them into images. This provides a technical solution for migrating traditional Java applications to the cloud without any modification.

7 Unique Advantages

This chapter mainly introduces the unique advantages and competitive strengths of FlyingServer in the domestic and international commercial and open-source application middleware markets.

7.1 All-Round Adaptation

FlyingServer adapts to all mainstream home-grown servers, CPUs, OSs, and databases. Compliant with Jakarta EE 8, it can effectively replace products such as JBoss, WebLogic, TongWeb, BES, Apusic, and Tomcat.

7.2 Simple Implementation

FlyingServer enables seamless migration to the platform without code modifications for complex application scenarios by fast delivery. Typically, adaptation can be completed in two weeks, ready for deployment. In a recent WebLogic migration project, FlyingServer facilitated business-driven migration without application redesign.

7.3 Better Performance

In ICT testing, FlyingServer ranks among the top in performance metrics. In horizontal comparatives with commercial and open-source middleware, FlyingServer performed on par with foreign commercial products in over 70% of performance test items and surpassed similar products in about 30% of the projects.

7.4 Augmented Autonomy

FlyingServer is grounded in home-grown autonomy and controllability. In ICT testing, by using Prism Seven-Color FossCheck, FlyingServer achieved an impressive code autonomous rate of 94.11%.

7.5 High Security

FlyingServer undergoes risk scanning, showing no high-risk vulnerabilities and avoiding the application of high-risk open-source components, meeting the security requirements of ICT innovation tests. It is suitable for industries with high-security demands, such as government, finance, security assurance, and telecommunications, which are critical to national interests and public welfare.

The product also integrates national cryptographic algorithms, enhancing application access security through encrypted data transmission.

7.6 Tool Integration

FlyingServer integrates with SpringBoot for developers to directly use. Projects can be packaged as JAR files and run without deploying in a container environment, which simplifies the development and deployment for more user-friendly.

7.7 Customization and High-Quality Services

With a high level of autonomy, FlyingServer supports deep customization according to business needs, aligning with the specific characteristics of domestic enterprise requirements.

In terms of services, FlyingServer offers standard and tailored O&M services in different use scenarios.

8 Scenario Solutions

This chapter introduces the scenario solutions of FlyingServer.

8.1 Tomcat Replacement

By replacing Tomcat, FlyingServer facilitates the transition from foreign open-source products to home-grown ones for higher domestic autonomy, security, and control. It meets the customer demand for localization.

8.1.1 Application Scenarios for Tomcat Replacement

The application scenario involves Java service development and Java software deployment.

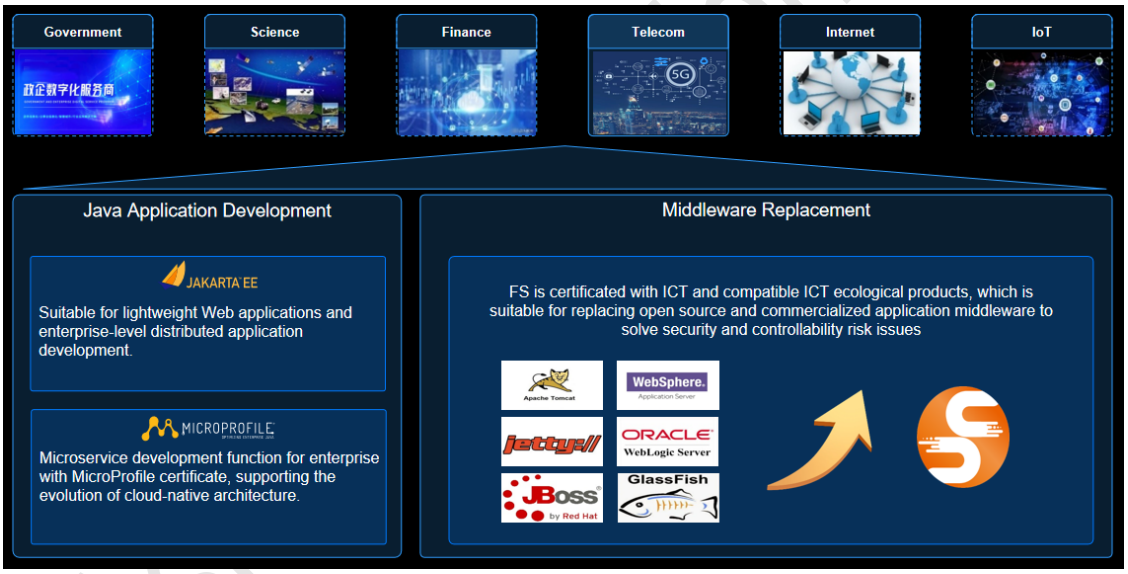

Figure 8-1 Application Scenario

8.1.2 Service Requirements for Tomcat Replacement

Due to national policies, the customer needs to increase the application rate of home-grown products and reduce dependence on foreign open-source middleware by adopting solutions that meet ICT standards.

A fixed network terminal system of a provincial telco has applied Tomcat before. The client aims to pilot toward home-grown middleware without reducing on system's functionality, stability, and performance.

The client also wants to enhance security by domestic encryption, all while minimizing modifications to the business codes.

8.1.3 Solution for Tomcat Replacement

The web container processes HTTP requests independently, so it does not impact the system or functional architecture of business applications. The replacement process primarily involves applying web container to manage user requests as the Servlet container.

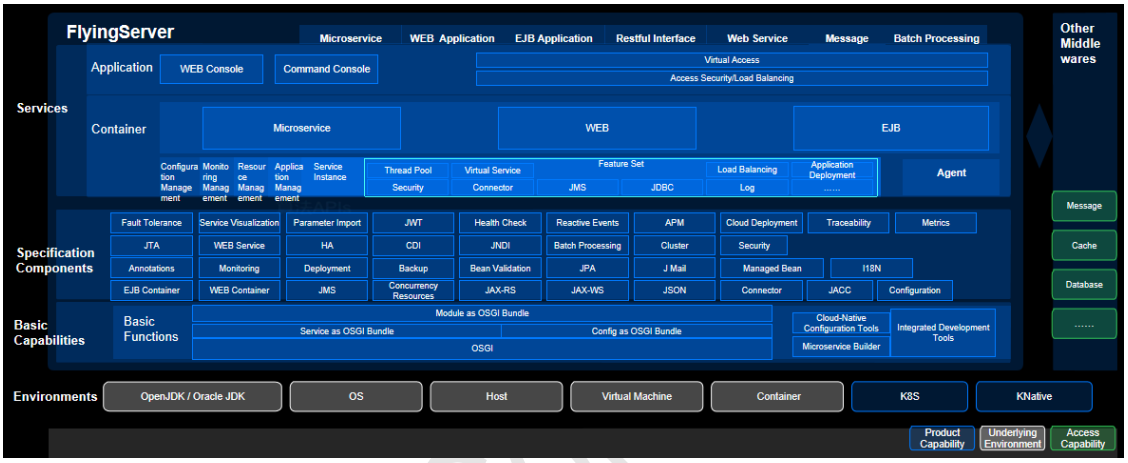

Figure 8-2 Product Portfolio

8.2 Jetty Replacement

By replacing Jetty, FlyingServer enhances the home-grown level and security controllability.

8.2.1 Application Scenarios for Jetty Replacement

The application scenario involves Java service development and Java software deployment.

8.2.2 Service Requirements for Jetty Replacement

Due to national policies, the customer needs to increase the application rate of home-grown products and reduce dependence on foreign open-source middleware by adopting solutions that meet ICT standards.

The client applies AsiaInfo's BOMC system with Jetty and intends to initiate a pilot towards home-grown middleware replacement without reduction on the system's functionality, stability, and performance.

The client also wants to enhance security by domestic encryption, all while minimizing modifications to the business codes.

8.2.3 Solution for Jetty Replacement

The web container processes HTTP requests independently, so it does not impact the system or functional architecture of business applications. The replacement process primarily involves applying a web container to manage user requests as the Servlet container.

9 Use Cases

9.1 Homegrown Middleware Replacement for a Provincial Telco

A telco's centralized service applies WebLogic for the EJB container. According to the requirements for autonomy, there is a need to replace WebLogic with home-grown middleware.

9.1.1 Customer Requirements

The telco relies heavily on foreign commercial and open-source middleware. As international conditions change, there is a need to replace these with home-grown solutions with higher stability and continuous system availability.

9.1.2 Solution and Effects

By replacing WebLogic, FlyingServer migrates the business logic to its EJB container. Standardized remote calls in FlyingServer enable communication between different business components.

The home-grown autonomous product can be deployed without any changes to the business logic. After the replacement, the system has been running stably to date.

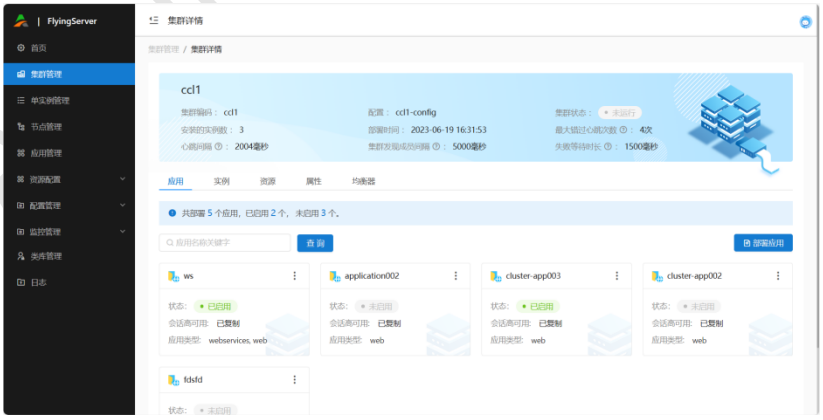

Figure 9-1 Homegrown Middleware Replacement

9.2 Home-Grown Middleware Replacement for a High-Speed Rail Station

A high-speed rail station in a municipal province intends to utilize home-grown systems and equipment for its IT system to ensure security and enhance autonomy. The station is one of the four main traffic terminals in the city's central hub, integrating high-speed rail with transport modes such as long-distance buses, metro, public buses, and taxis. The IT OS is still integrating other tools and developing continuously.

9.2.1 Customer Requirements

Most IT systems currently rely on foreign commercial and open-source middleware. As international conditions change, there is a need to replace these with home-grown solutions with higher stability and continuous system availability.

The target products must ensure compatibility across different upstream and downstream systems and meet various requirements such as functionality, non-functionality, security, and stability.

The product involved in the solution must have domestic IP rights and pass ICT certification. It should support deployment on domestic servers, OSs, and databases with high security, stability, and better performance as well as international commercial products like WebLogic and Tomcat, with comprehensive features.

9.2.2 Solution and Effects

FlyingServer can replace middleware like Tomcat in legacy systems and for web application development in new systems.

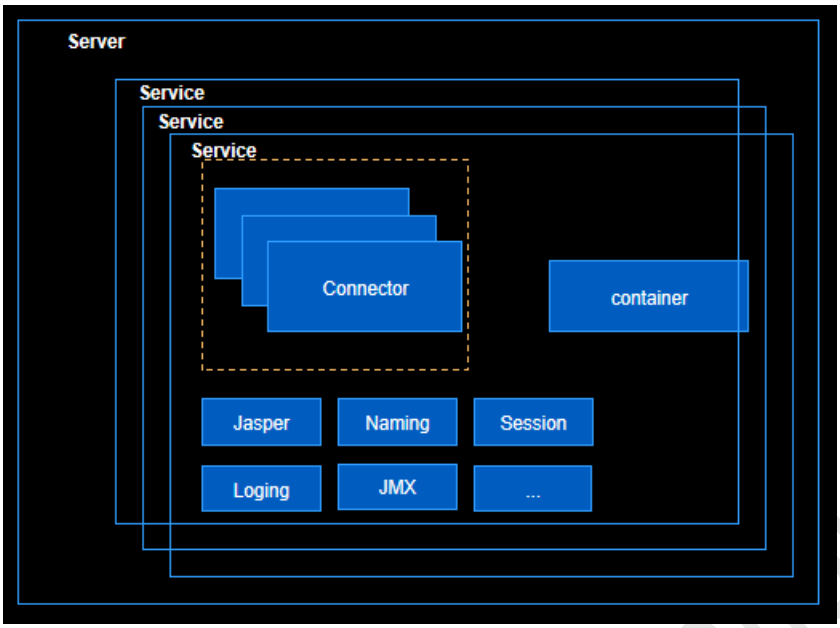

Figure 9-1 Solution Architecture

At the planning stage of high-speed rail station, FlyingServer has set up the test environment and tested application integration There are 17 FlyingServer validation environments on-site, with 58 system integration tests conducted.

With FlyingServer, the legacy applications were successfully migrated with zero modification to seamlessly replace foreign commercial products. The new system supports both integrated and separated deployment modes, catering to the needs of different business development teams.

During the validation process, the system hosted on FlyingServer achieved a reliability of 99.999%, with average call latency under 20ms and a success rate above 99.99%.

10 Certificates and Awards

AISWare FlyingServer has been recognized industry wide and obtained various certificates and awards.

- Kunpeng + UOS Certificate

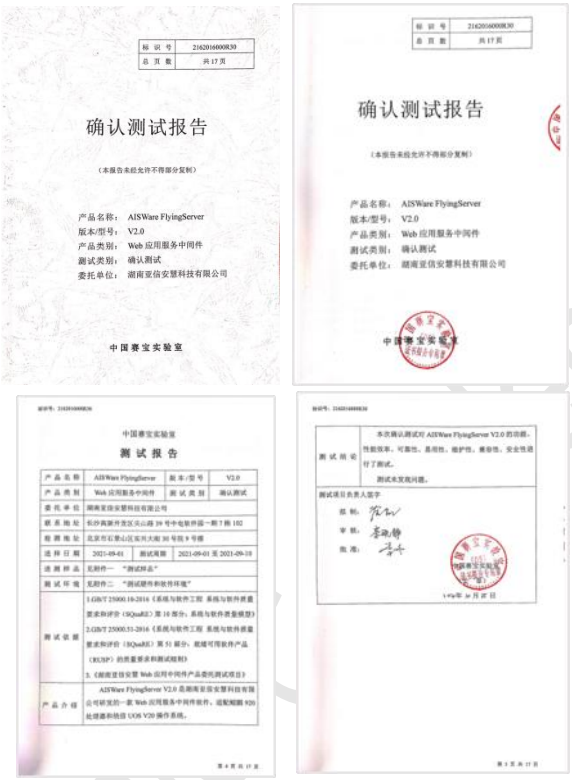

Figure 10-1 Kunpeng + UOS Certificate

- Phytium +Kylin Certificate

Figure 10-2 Phytium +Kylin Certificate

- HYGON+ Uniontech Certificate

Figure 10-3 HYGON + Uniontech Certificate

- Processor Compatibility Certificates

Figure 10-4 Processor Compatibility Certificates

- Database Compatibility Certificates

Figure 10-5 Database Compatibility Certificates

- Operating System Compatibility Certificates

Figure 10-6 Operating System Compatibility Certificates

- Server Compatibility Certificates

Figure 10-7 Server Compatibility Certificates

- Jakarta EE Certificate

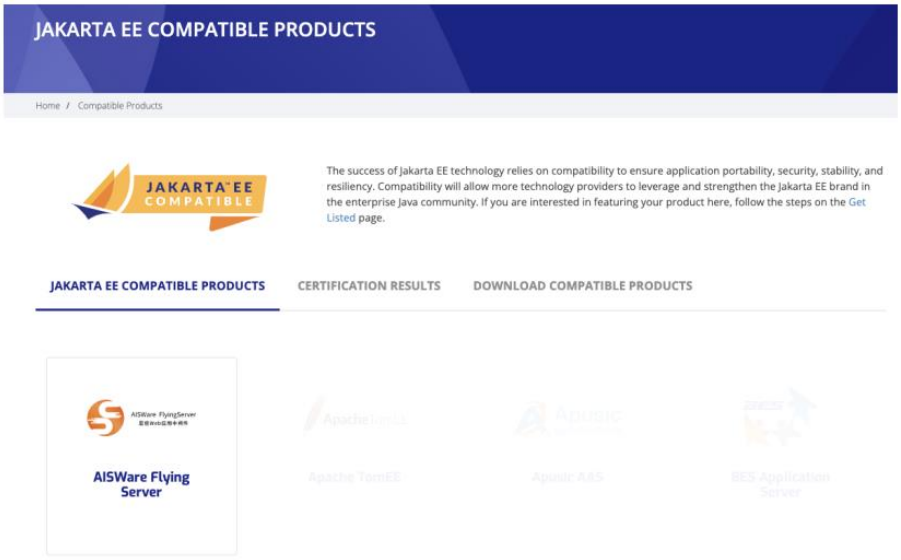

Figure 10-8 Jakarta EE Certificate

- MicroProfile Certificate

Figure 10-9 MicroProfile Certificate

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