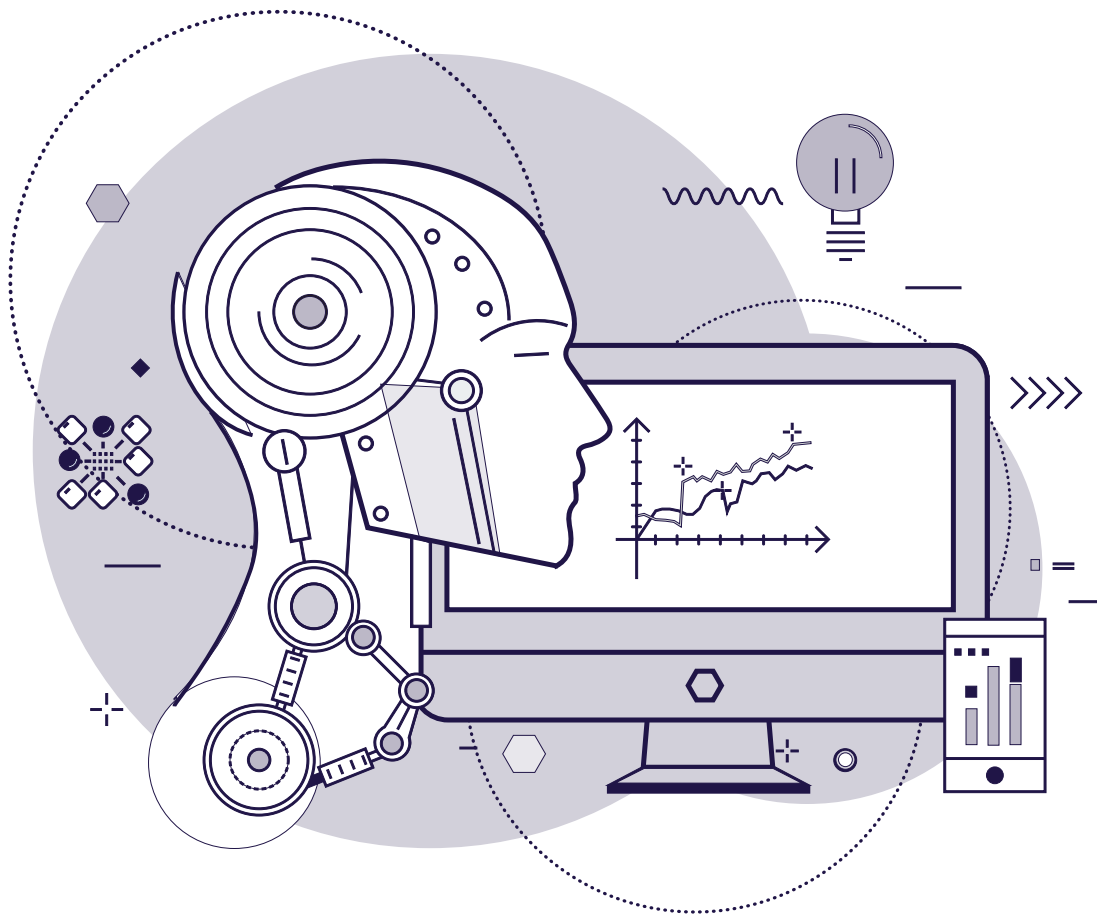


# Zen AI White Paper



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## Product Background

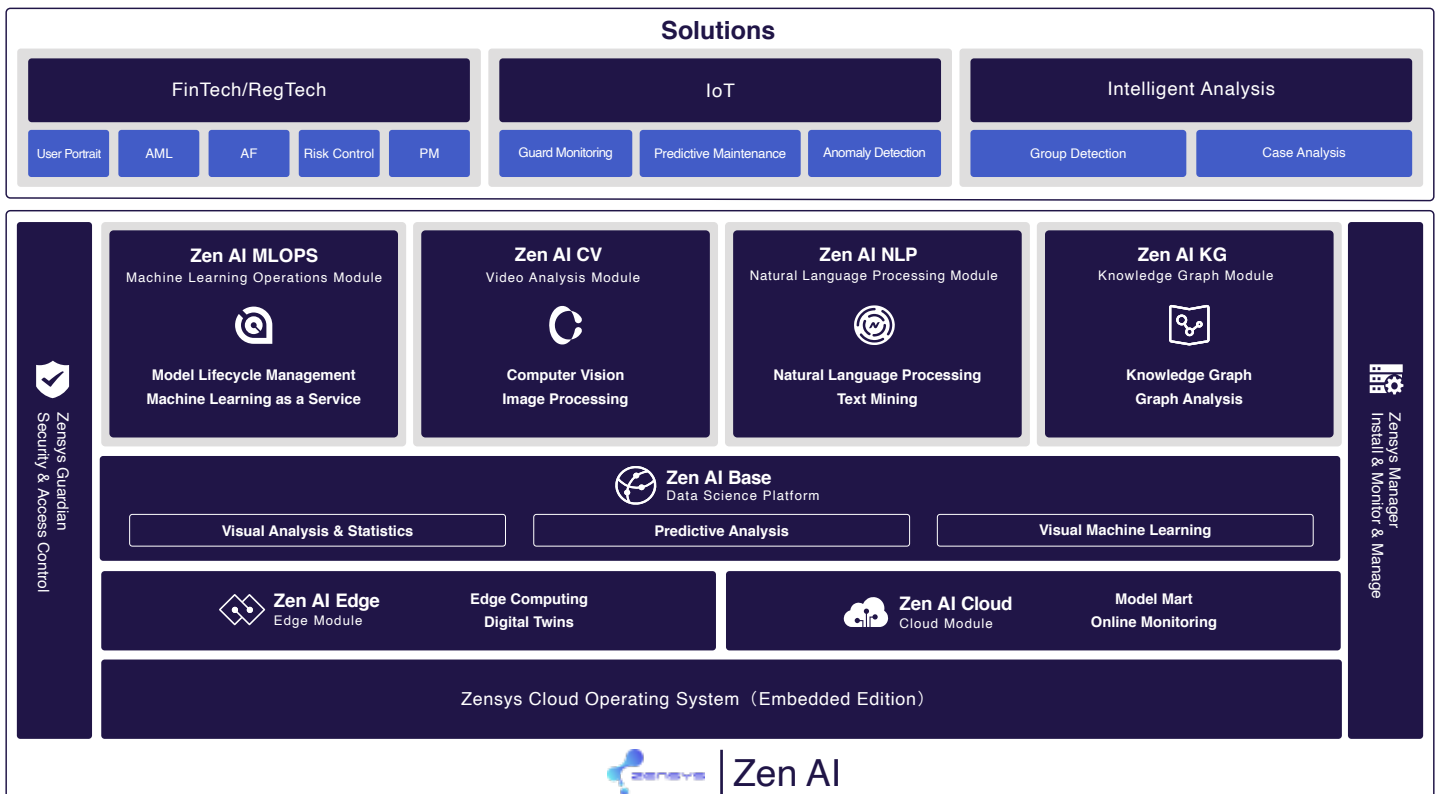
Zensys Zen AI is a one-stop artificial intelligence platform. Based on this platform, users can quickly complete the lifecycle development of machine learning from feature engineering and model training to model launch. To guide users to quickly build solutions for specific scenarios, Zen AI provides templates for experimental processing in multiple scenarios. At the same time, the Data Mart module of the platform breaks the original table-centric data management mode and builds an emerging data management mode that centers on entities with depicting entities from the dimensions of 'relationships' and 'features'. In order to allow data scientists to process the model more flexibly, Zen AI provides two modeling methods: visual modeling and code modeling. And the Model Mart module of the platform makes it more convenient to put models on shelves, make them go online and monitor them online. In addition, Zen AI integrates a number of industry-oriented analysis tools, including Knowledge Graph Module, Entity Portrait Module, Report and Video Analysis Module, which make Zen AI become a basic artificial intelligence platform that integrates data processing, model processing, online monitoring and data analysis.



## Product Architecture

### Zen AI can be divided into two levels from bottom to top:

- One is the underlying base platform layer that includes three modules: Zen AI Base, Zen AI Edge and Zen AI Cloud. Zen AI Base (Data Science Foundation Platform) has complete data exploration, multiple data source access, experimental scheduling, intelligent analysis, user assets and platform management and other functions. Zen AI Edge (Edge Module) mainly deals with the connection between objects and objects, the connection between objects and people, the connection between objects and AI, and the connection between objects and clouds. Zen AI Cloud (Cloud Module) is important in model's life-cycle management, providing a complete online closed-loop of the model to help users manage online services more easily and realize the value of the model.
- The other is the upper business model layer that includes four modules: Zen AI MLOPS, Zen AI CV, Zen AI NLP and Zen AI KG. Zen AI MLOPS(Machine Learning Operations Module), as an all-inclusive machine learning operations platform, enables users to create a complete life cycle of machine learning models. Zen AI CV (Computer Vision Module) uses advanced machine learning and deep learning algorithms to provide deep insight into image data. Zen AI NLP (Natural Language Processing Module) supports solving industrial practical problems from text crawling and labeling, to text cleansing, corpus building, semantic understanding, language reasoning and other aspects. Zen AI Cloud (Cloud Module) supports analysis and display of multiple relationships between entities, dynamic timeline screening, time evolution of analysis cases, layout settings of multiple relationships, and attribute editing of entities/relationships, which also uses various graph calculation algorithms to help users discover more valuable graph data.



## Technical Characteristics

As a powerful AI platform, Zen AI has six technical characteristics as follows:

### I. Cloud Native Model Service

Zen AI empowers users to publish and subscribe to an extensive range of model services. These services exemplify agility, reliability, scalability, and exceptional adaptability, while also offering fault-recovery and non-disruptive, continuous updates for seamless business operations. The platform provides a formidable technical foundation for the application layer, ensuring optimal performance. Concurrently, it supports the categorization of model services based on usage, architecture, and other criteria, streamlining the subscription process and enhancing user experience.

### II. Progressive Model Iteration

Users can effortlessly execute routine model iterations online via ETL processing, model training, and launching, as well as other experimental procedures. Leveraging the cyclical management of task flow, it enables users to regulate the frequency of online model iterations with precision. In conjunction with the container-based online model system, Zen AI simplifies rolling releases and expedites horizontal scaling, providing a seamless and efficient model management experience.

### III. Cloud Edge Integrated Model Deployment

Zen AI has skillfully established a seamless connection between the cloud and the edge. On one hand, it ensures the effective distribution of models, functions, and applications from the cloud to the edge, while also facilitating real-time monitoring of model deployments. On the other hand, it enables real-time data flow sharing between the cloud and the edge, fostering a harmonious integration between the two realms. Through these efforts, Zen AI bridges the gap and unifies the cloud and edge computing environments.

### IV. Entity-Centric Feature Management

Zen AI presents users with a data marketplace that emphasizes entities and relationships, transcending the traditional table-centric approach to data processing. This innovative platform enables the seamless merging of structured and unstructured data. By utilizing attributes, such as features and indicators, as a connecting bridge, Zen AI paves the way for feature engineering and model training. Simultaneously, the platform employs entities and relationships as the foundation for constructing graphs, ensuring a cohesive integration of data processing, data analysis, and data application, ultimately revolutionizing the way users interact with and leverage data.

### V. Visual Modeling

Zen AI delivers ultimate visualization through a powerful drag-and-drop interface, encompassing data reading, ETL, feature engineering, model training, application, and evaluation, all without writing code. Boasting exceptional ETL processing, high-performance operators, and one-stop interface operation, Zen AI enables quick machine learning adoption for analysts and businesses, while also providing an efficient experience for data scientists. Custom operator coding allows advanced functionality and seamless switching, offering users a highly unified experience.

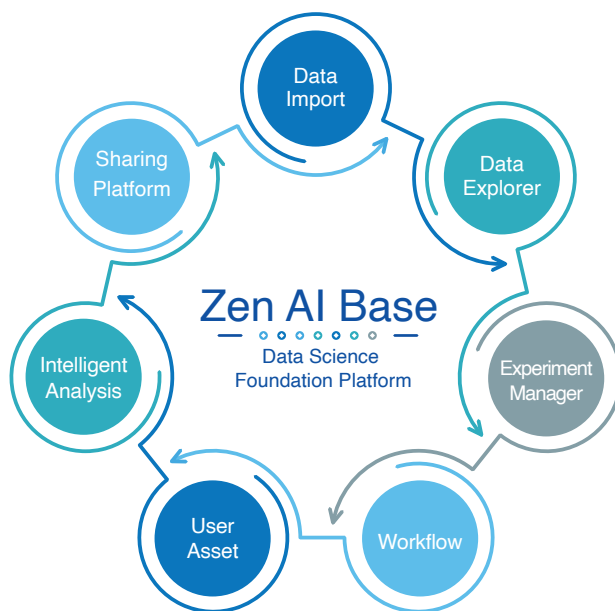
### VI. Scenario Experiment Template

Zen AI offers varied scenario templates and one-stop interface operation, guiding users to swiftly create experiments. Its comprehensive AI development platform supports massive data preprocessing, large-scale distributed training, and automated model generation. With on-demand deployment capabilities via the end-edge-cloud model, Zen AI enables rapid creation and deployment for diverse business scenarios, delivering an optimal user experience for managing full-cycle AI task flows.

# Zen AI Base – Data Science Foundation Platform

## Function Introduction

Zen AI Base is the basic platform with modules including data import, data explorer, experiment manager, workflow, user asset, intelligent analysis and sharing platform.




**Data Import**



Zen AI Base supports multiple data sources. Users can import data in a variety of ways. In addition to deep interfacing with Zensys Data Hub, they also support multiple data sources, including RDBS, HDFS, ORC, Parquet, local CSV, etc. It also supports HDFS and NFS file systems, exposing users to the API for unified file operations.

**Data Explorer**



Zen AI Base supports two ways of data exploration: SQL exploration and Notebook exploration. In addition to satisfying the data exploration function for users, it also supports data analysis and other related tasks through SQL statements and writing python/R language scripts via Notebook. Users can view the distribution and description statistics of each column of data. Furthermore, it can conduct multi-dimensional cross-analysis on multi-column data, and support a variety of visualization methods such as bar chart, pie chart, scatter chart, etc., so as to prepare for subsequent data preprocessing and feature engineering.



### Experiment Manager

As the smallest unit to be scheduled, the experiment is divided into many different types according to the process and the mode of data processing, including data cleansing, model training, feature engineering, graph calculation, model automatic shelving, script task, flow processing, automatic modeling, automatic feature extraction and other types.



### Workflow

Tasks are used to manage multiple experimental trigger logic and scheduling dependencies in business scenarios, with built-in business scenario templates. Through the guidance of templates, users can quickly create business experiments that meet their own needs. At the same time, the platform also provides the monitoring function of task status after going online.



### User Asset

Platform user assets include two management modules: service market and data market. The service market has a whole process of putting model, application, function and other services on the shelf and online, which can meet users' management needs of constantly iterative service version. At the same time, user publication services support sharing and collaboration through the service marketplace. As one of the tools for users to manage assets, the data market is used to store valid data after feature processing. In addition, the data market not only supports the reading and writing of shared data, but also supports the functions of defining and querying the entities, relationships and features of the data.



### Intelligent Analysis

The platform integrates a large number of industry-oriented analysis tools, including knowledge mapping tools, entity portrait tools, reporting tools, video analysis tools and so on. For user assets, users can rely on all platform tools to process data assets in user assets to solve application problems in their own scenarios.



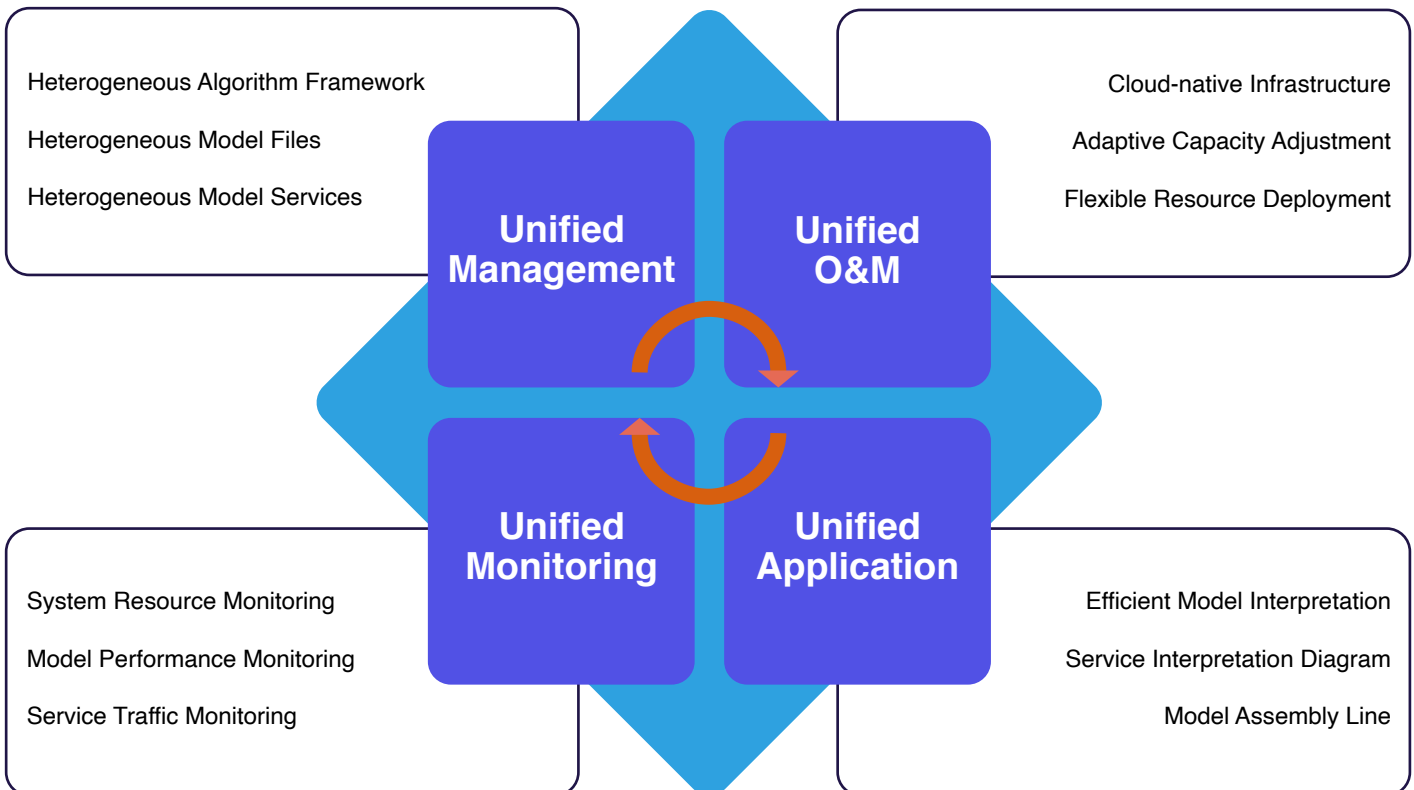
### Sharing Platform

While supporting team collaboration, Zen AI Base supports group sharing of data sources, data sets, experiments, codes, models and so on, which can greatly improve the team's efficiency and reduce a lot of rework.

## Zen AI MLOPS – Machine Learning Operations Module

### Function Introduction

Zen AI MLOps is an enterprise-level AI capability operation platform built on cloud-native architecture, focusing on the full lifecycle of machine learning models. It focuses on key aspects of model management, model deployment, model monitoring and alerting, model evaluation, and model iteration in the whole lifecycle of machine learning models. Through unified management and operation. The platform provides enterprise customers with easy-to-use, efficient, safe, and reliable AI capability operation services through unified management, operation and maintenance, application, and monitoring. It helps customers to manage the growing number of machine learning models, improve the efficiency of model usage, reduce the cost of model integration and management, and control the risk of model production environments.





## The main functions are as follows :

### I. Service Management

Zen AI MLOPS supports all-around service management through service monitoring, testing, auditing and model evaluation.

### II. Service Interpretation

Zen AI has a visualization interface that supports a simple drag-and-drop operation with minimal parameter configuration to build models and services while leaving room for immense customization with complex interpretation logics of a multi-model service.

### III. Service Publication

- One-click deployment of model applications with merely simple configuration of service parameters to quickly generate service APIs.
- Support for custom configuration of elastic scaling policies, using dynamic scaling to achieve load balancing.
- Support for multi-version traffic allocation strategies, with grayscale release, A/B testing capabilities.
- On-demand allocation of resource usage of each node, including CPU, GPU and memory, etc.

### IV. Model Management

- Universal nano-management of multi-source heterogeneous algorithm frameworks, model files and model services.
- Standardize integration management and unify deployment of large-scale machine learning models that significantly reduce model management costs.

### V. Service Imaging and Deployment

- Supporting data connection of model images between Zen AI Base and Zen AI MLOPS with one-click deployment of Zen AI Base machine learning models.
- Support access to other packaged model container images and unified nano-management, operation and monitoring in Zen AI MLOPS.

## Zen AI CV – Video Analysis Module

### Function Introduction

Zen AI CV is an image data analysis component based on artificial intelligence, which supports access to various videos and image data and meets the needs of various application scenarios. At the same time, it also supports to provide customized video algorithms and algorithms' optimization for business departments, which greatly enhances the business department's deep application capability for upper-layer video.

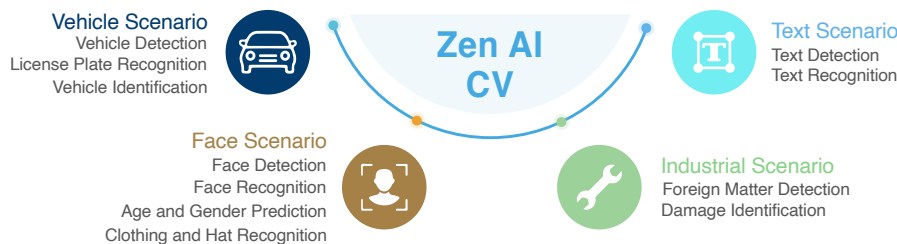
### The main functions are as follows:

#### I. Image Retrieval

Zen AI CV supports image search, face matching search, image content search and other forms, fully satisfying the image-based content search in various business scenarios.

#### II. Image Analysis

The core functions of Zen AI CV include sub-functions such as action sequence mining, model prediction, anomaly information extraction and so on. Users can directly dock the Zen AI Base platform data modeling results for end-to-end image mining, which can create a sophisticated intelligent video analysis application. At present, four application scenarios have been supported: vehicles, faces, industries and texts.



#### III. Monitoring Center

The monitoring center of Zen AI CV is responsible for the docking and display of video image data sources, including camera docking, NVR docking, offline data source docking, real-time data source docking and so on. It also supports a large number of real-time video stream processing, adapting to multi-angle, multi-scenes industry applications, which provides a powerful guarantee for image analysis.

#### IV. Problem Base

The problem base of Zen AI CV has the functions of sensitive and accurate identification and alarm, which can automatically predict and alarm potential threatening targets. The detection information and video location of potential security hazards are stored in the problem base, which is convenient for users to view and manage.

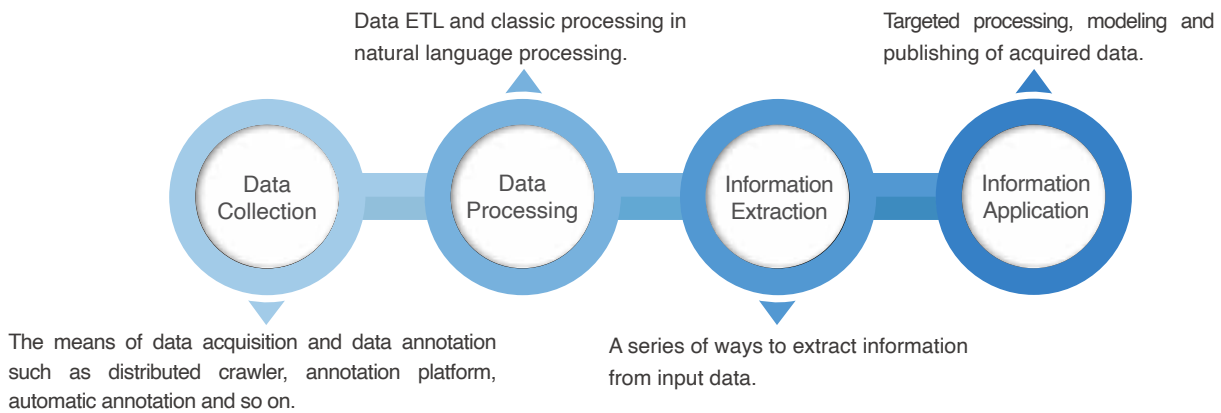
#### V. Management Center

Zen AI CV's management center integrates access devices and information resources to efficiently share video, images and models across regions and departments through efficient storage and high-fidelity image compression. At the same time, its perfect network scheduling of monitoring resources provides application support for realizing visual management.

# Zen AI NLP (Natural Language Processing Module)

## Function Introduction

Zen AI NLP synthesizes various aspects of natural language processing tasks, from text crawling and tagging to text cleaning, corpus construction, semantic understanding, language reasoning, and so on, which creates abundant tools and operators. Zen AI NLP's one-stop operation brings powerful functions, such as efficient iterative development, and wider coverage to both users who are new to NLP and professional analysis developers. As the following graph shows, it includes four main processes: data collection, data processing, information extraction, and information application.



### I. Data Collection

It provides configurable distributed crawlers and several accumulated knowledge bases for various scenarios and requirements, which can be directly used by customers as existing knowledge. In addition, Zen AI NLP also includes an annotation platform to realize entity annotation, relationship annotation, attribute annotation and category annotation with service for automatic annotation, annotation review and annotation modification of models.

### II. Data Processing

It includes flexible data cleaning operators and ETL tools. At the same time, it can manually write scripts to process data according to the needs of customers based on the changing characteristics of data processing scenarios. For the rough data input, Zen AI NLP provides new word discovery, word segmentation and deep representation of word meaning in SOTA (State-of-the-art), as well as other tools such as part-of-speech tagging.

### III. Information Extraction

It provides named entity recognition, generation of multiple word vectors and sentence vectors in SOTA, text understanding, relationship extraction and other algorithms, and provides a large number of NLP basic algorithm models for easy use.

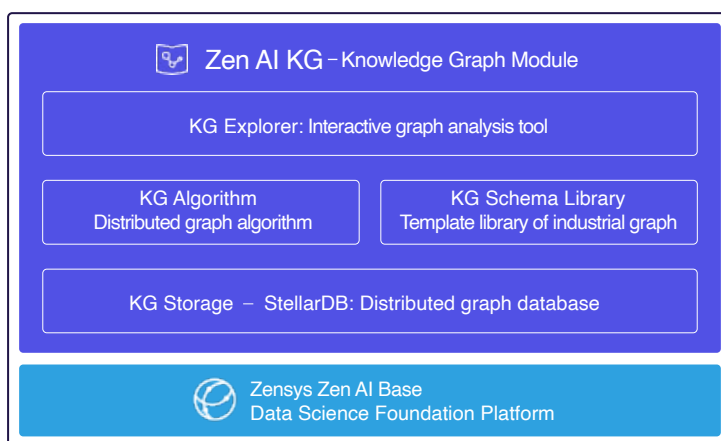
### IV. Information Application

There are many explorations and schemes in the information extraction and information matching of standard documents in financial knowledge map, industry map and vertical domains, the entity extraction and smart Q&A of interested contents in short messages, the semantic recognition and semantic similarity matching of legal documents in intelligent justice, the information integration of multimodal data and many other aspects. Meanwhile, it provides strong supports for similar applications and scenarios.

## Zen AI KG – Knowledge Graph Module

### Function Introduction

Zen AI KG is based on Zen AI Base, which integrates acquisition, fusion, storage, computation and application for knowledge. And it supports drag-and-drop graph construction, distributed graph storage, distributed graph computing and interactive graph analysis.



### Application Value of Knowledge Graph

At present, in addition to the general large-scale knowledge graphs, various industries are also building knowledge graphs of industries and fields. Currently, the application of the knowledge graphs includes semantic search, Q&A system and chat, semantic analysis of big data, intelligent knowledge service and so on, which have a wide application value in real scenarios such as intelligent customer service and business intelligence.

#### Semantic Search and Recommendation

Knowledge graph can map the key words entered by users into the concept and entity of the objective world in the knowledge graph, and the search results directly show the structured information content that meets users' needs, rather than the Internet pages.

#### Q&A and Dialogue System

The knowledge-based Q&A system treats the knowledge graph as a large-scale knowledge base. By transforming users' questions into queries on the knowledge graph through understanding, the answers to users' questions are directly obtained.

#### Big Data Analysis and Decision Making

Knowledge Graphs can help understand big data, gain insight into big data, and provide decision support through semantic links.

## The main functions are as follows:

### I. Built-in Industrial Graph Template with Drag and Drop to Quickly Build the Graph

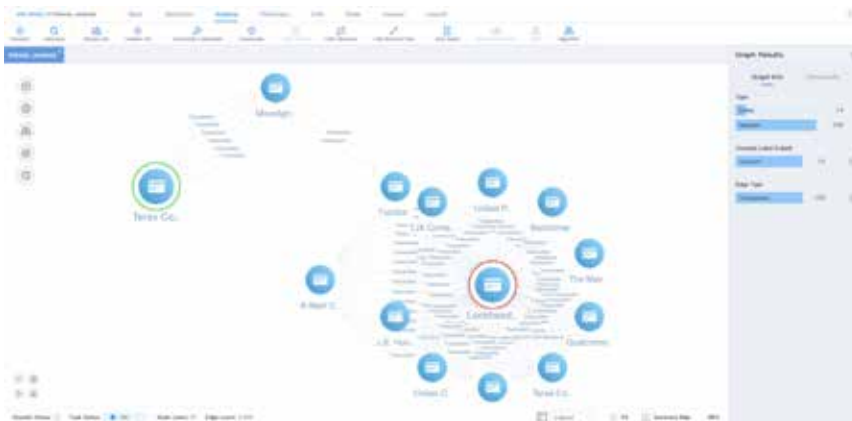
Based on the label indicator processed by Zen AI Base platform and the built-in graph template of different industry fields in Zen AI KG, users can quickly construct complex multi-relationship graphs, which greatly facilitates the users' experience of constructing graphs.

### II. Finding the Value of the Graph with the Help of Algorithm

Zen AI KG provides a variety of graph distributed algorithms, including self-developed FraudRank anti-fraud algorithm, NATE depth graph algorithm, etc. With the algorithms in Zen AI Base platform, it can help users find more valuable graph data.

### III. Locking Key Information of Any Spatio-temporal Points Based on Time-Space Correlation Analysis

Zen AI KG supports user's time-space correlation analysis of entities, relationships, events and other data. The dynamic timeline view supports viewing dynamic changes in entities and relationships over time, while the map view supports viewing geo-location information about entities and relationships. Zen AI KG also supports comprehensive data analysis by combining the three-dimensional spatial and temporal dimensions.



### IV. Supporting Version Comparison and Focusing on the Time Evolution of Graphs

For the rapidly changing data, Zen AI KG adds the function of version comparison and time comparison to monitor the changes of entities, relationships and attributes in the graphs. For each analysis case, the user can choose to view the evolution between different versions of the graph datasets in the time dimension.



## V. Associating the Individual Portraits to Achieve the Ultimate Visualization

Each entity in the map can be associated with an individual portrait view, and the portrait dashboard can be bound with different label attributes according to business requirements. Users can change the size and position of the panel by dragging and dropping to achieve personalized presentation.



## VI. Intelligent Semantic Retrieval

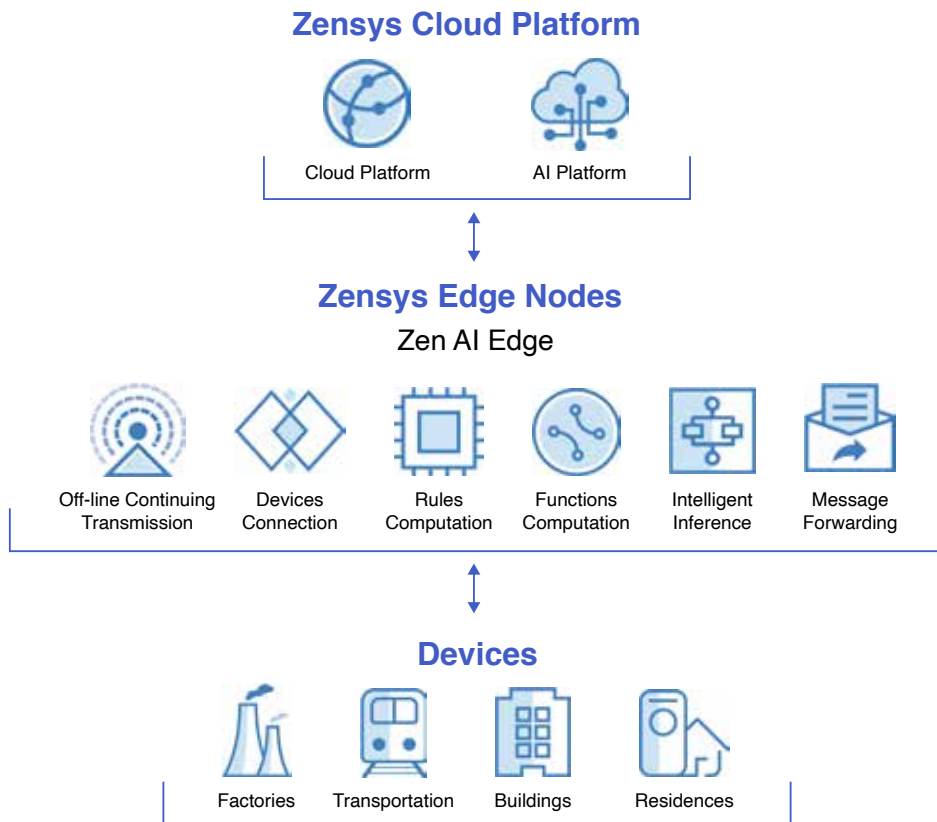
According to different knowledge fields stored in the database, users only need to input keywords in this field, which can be mapped to concepts and entities of the objective world in the knowledge map. The search results directly show the structured information content that meets users' needs, rather than Internet pages. It also can automatically correlates and classifies data to automatically match the most urgent or prior information.



# Zen AI Edge – Edge Module

## Function Introduction

Zen AI Edge uses Zen AI Base's ability of model processing and model online to deploy the model to the edge. It has realized the intelligent transformation of traditional equipment and has solved the connection of objects and objects, the connection of objects and people, the connection of objects and AI, and the connection of objects and the cloud.



### Devices Connection

It has built-in MQTT, Modbus and other device interfaces, and allows customization of third-party interfaces.

### Rules Computation

Data processing rules are defined through visual interaction to complete real-time calculation of timing or video devices.

### Functions Computation

Users can write custom functions to increase data processing flexibility and seamlessly integrate rule computations.

### Intelligent Inference

Low latency AI inference functions can be implemented by deploying inference services locally.

### Message Forwarding

Edge data can be temporarily stored locally or forwarded to the cloud to achieve high- and low-value data shunting.

### Off-line Continuing Transmission

It can support the continuation and synchronization of edge data and cloud data after network restoration.

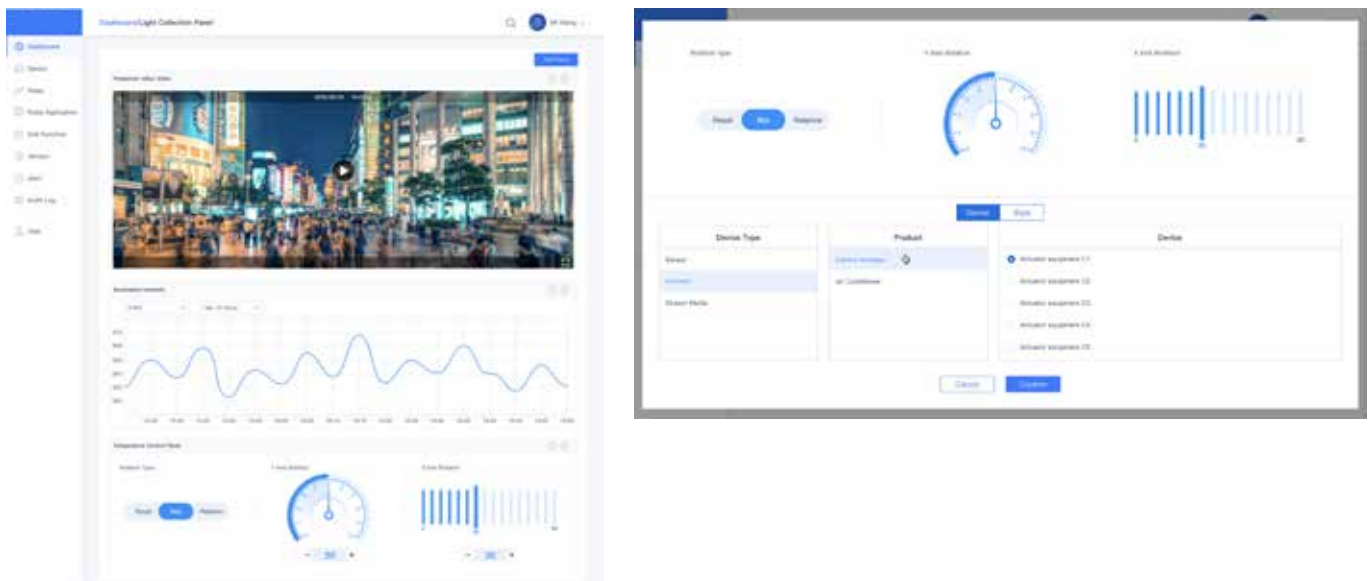
## The main functions are as follows:

### I. Devices Connection

Zen AI Edge can be connected to timing devices such as sensors, PLCs and streaming media such as cameras. Data processing for timing data can not only call common time window functions, aggregation functions and other common operators, but also can carry out complex logical processing by calling non-service functions and AI models. For streaming media data such as videos and audios, the platform provides codecs, shunts, and composites unique to streaming media data which can help users quickly parse data from various streaming media sources. Meanwhile, through Trantor model and voice model, AI functions such as video detection, video recognition and voice recognition can be quickly realized. Through the built-in data bus, users can extract structured data from streaming media and use it in the processing of sequential data, thus breaking the processing boundary between structured data and unstructured data.

### II. The Dashboard

Users can customize the dashboard and console to display the real-time status of the device through the dashboard. They can also directly change the status of the device through the console.



### III. Calculation of the Service-Free Function

The service-free function can be deployed on the edge side. And through the service-free function, the user can define the logic that the current operator cannot satisfy, which enhances the flexibility of the system.

### IV. Lifecycle Management

Through the cloud, users can conduct version management, grayscale upgrading and other operations for applications, functions, processing templates and models on the edge which can reduce the cost of operation and maintenance at the edge.

### V. Cloud Management

The cloud provides a unified view of the edge, allowing users to view all registered edge nodes and status. In addition, the applications, models, functions and processing templates which are on shelf in the cloud are distributed to the edge, which can realize the function of multiple deployments in one development.



## Zen AI Cloud – Cloud Module

### Function Introduction

Zen AI Cloud manages the model online management which is an important part of the model's lifecycle. It provides rich functions such as model image version management, model online monitoring, offline statistics, horizontal expansion, rolling upgrade and A/B testing. And Zen AI Cloud provides a complete online closed-loop of the model to help users manage online services more easily and realize the value of the model.

### The main functions are as follows:

#### I. Version Management of the Model Image

When using the container technology to manage the model version, each version is a Docker image. In this way, Zen AI Cloud can integrate the model files with the runtime environment, which can be deployed directly and reduce the burden of going online.

#### II. On-Line Monitoring and Off-Line Statistics

Zen AI Cloud provides abundant online monitoring indicators, which include the statistics of real-time system resources CPU and internal storage, and the calculation of model indicators. Through the monitoring of online indicators, customers can find model problems and respond to them in time. Meanwhile Zen AI Cloud stores the predicted results of the model into Zensys's storage product for offline statistics, so as to facilitate customers to record the historical records.

#### III. Horizontal Expansion

Stateless model management can facilitate horizontal expansion. This function can be combined with online monitoring function to automatically expand the capacity when the system resource usage reaches the threshold value, which can eliminate the tedious work of manual expansion.

#### IV. Rolling Upgrading

Zen AI Cloud provides a rolling upgrading of the on-line model. It can ensure that customer business systems are unaffected while model versions are iterated.

#### V. A/B Test

Customers often need to compare the effects of different versions of the models coming online to determine which model to use. Zen AI Cloud provides a flexible A/B testing strategy, and customers can develop their own traffic distribution rules to determine how to test which can help customers make quick decisions.