VIAS

Service Overview

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Contents

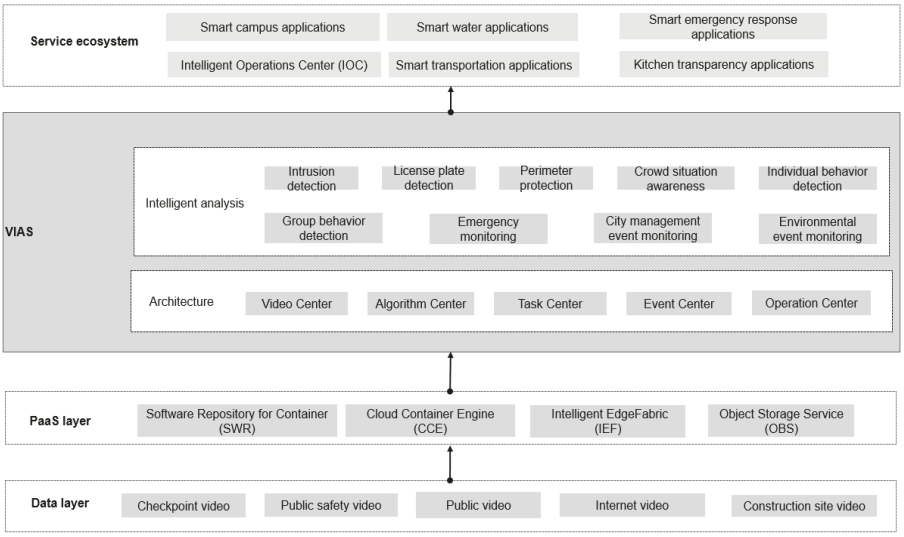
1 What Is VIAS?

Video Intelligent Analysis Service (VIAS) collects, distributes, dumps, and analyzes camera video data, and reports alarm events. By combing Huawei Cloud's leading AI and big data technologies, VIAS enables event detection, analysis, and decision-making for smart campus, city governance, smart water, and smart transportation.

Overview

VIAS ingests multi-source and multi-modal data on campuses. It provides algorithm services deployed on the cloud or edge nodes. These algorithm services are used to analyze the accessed data of people, vehicles, objects, and events for multi-dimensional sensing, cognition, and decision-making, meeting requirements of customers in different fields.

Figure 1-1 Solution architecture



Advantages

- The deployment mode is flexible. Algorithms can be deployed on edge nodes, which reduces bandwidth costs, or on the cloud. Algorithms deployed on edge nodes and the cloud are upgraded synchronously and charged based on usage.

- VIAS provides multi-modal data analysis with high concurrency and low latency powered by Kunpeng processors and Ascend AI chips, ensuring efficient campus services.
- VIAS provides deep learning-based intelligent analysis algorithms for high-precision sensing and processing of people, vehicle, event, and behavioral data.
- Combining video analysis, image processing, and natural language processing technologies, VIAS implements joint multi-modal analysis on video, image, and text data for campus and city governance to fully explore potential data correlation.

2 Applicable Scenarios

Commercial and Residential Campuses

Combining AI, big data, and cloud computing technologies, VIAS helps create smart campuses by providing a comprehensive campus management solution powered by intelligent technologies such as perimeter intrusion detection, detection of objects left behind, facial ID, automatic license plate recognition, and parking violation detection, covering campus security and pedestrian and vehicle management.

Industrial Parks

VIAS uses intelligent video analysis, IoT, and big data technologies to enable automated, intelligent management of industrial parks by providing key capabilities such as operation violation detection, fire and smoke detection, on-duty detection, personal protection equipment detection, and automatic admission of vehicles and people, ensuring safe production, emergency supervision, and security protection in industrial parks.

City Governance

VIAS uses city street videos and grid data management to detect events such as crowd gathering, street-side garbage, parking violations, and mis-placement of shared bikes in cities, improving city governance.

Smart Stadium

Leveraging AI and big data technologies, VIAS implements the highly intelligent management of crowd situational awareness and emergency response in stadiums by providing a smart stadium solution that includes head counting, a crowd density heatmap, crowd density detection, ID verification for both people and vehicles, fire and smoke detection, fire escape obstruction detection, and fall detection.

Smart Construction Site

Leveraging AI, big data and IoT technologies, VIAS implements the automatic monitoring of construction safety and the construction specifications of

construction sites by providing safety helmet and reflective clothing detection, restricted and adjacent area security alarms, absence detection, climbing detection, smoking detection, and mobile phone usage detection, helping supervision departments manage construction sites in real time and detect violations and security risks promptly.

Smart Station

Backed by cloud-edge-device synergy, VIAS uses AI to identify violations such as smoking and using mobile phones in gas stations, recognize clothing of on-site personnel, including whether they are wearing safety helmets and workwear, and reports alarms on fire and smoke, all in real time, ensuring the safe operation of gas sites.

3 Highlights

Geofence

Geofences, powered by the intrusion detection algorithm, are set in important areas to prevent unauthorized intrusion and destruction. Geofences are mainly used in campus security and smart city scenarios. If management personnel see unexpected behavior in the video, they send personnel to deal with it to avoid losses. Multiple objects can be detected simultaneously and alarms are generated accordingly.

Figure 3-1 Geofence 1

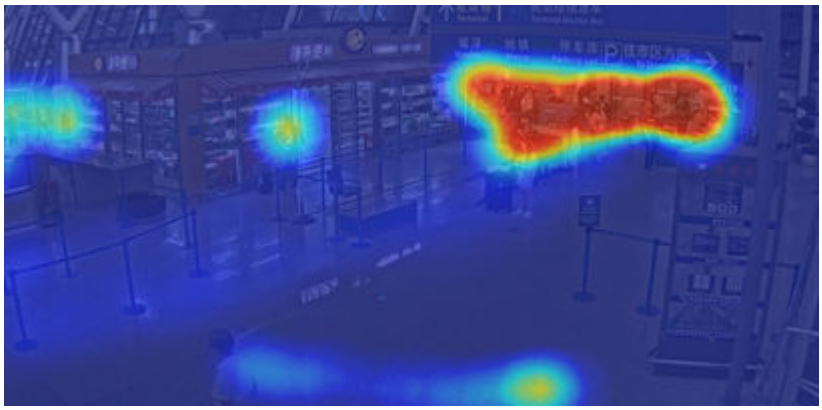
Figure 3-2 Geofence 2

Crowd Counting

The crowd counting algorithm counts people in an image captured by a camera. You can configure line-crossings, areas, and heatmap detection duration to customize policies for supermarkets and communities.

Figure 3-3 Crowd counting 1

Figure 3-4 Crowd counting 2



Away-from-Post Detection

The away-from post detection algorithm is used to monitor if the persons assigned to the specified areas leave their posts for over a specified period of time. If they do, alarms are generated.

Figure 3-5 Away-from post detection 1

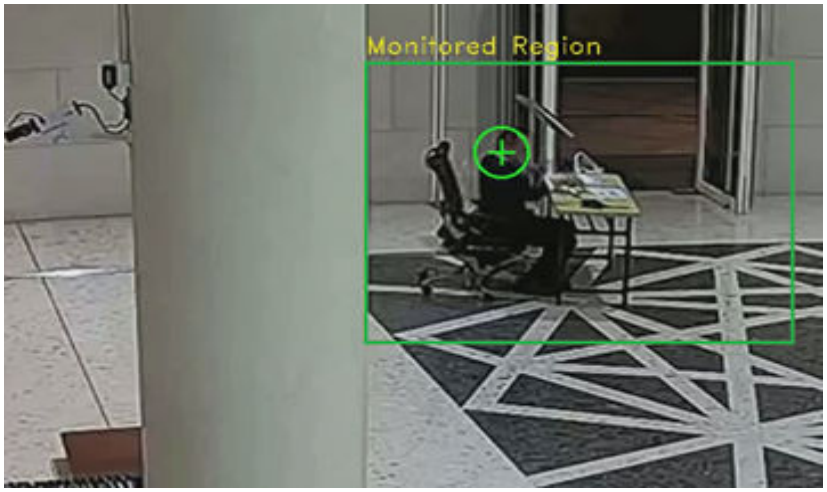


Figure 3-6 Away-from post detection 2

Fire Passage Obstruction Detection

The fire passage obstruction algorithm detects fire passage blockages and triggers alarms, facilitating intelligent and efficient campus management.

Figure 3-7 Detecting whether fire access routes are obstructed

Figure 3-8 Detecting whether fire escapes are obstructed

Safety Helmet and Reflective Clothing Detection

Backed by the work gear and helmet detection algorithm, cameras can detect persons who do not wear safety helmet or reflective clothing at construction site entrances or in specified areas. If violations are detected, alarms are generated and related photos are saved.

Figure 3-9 Safety helmet and reflective clothing detection

Figure 3-10 Safety helmet and reflective clothing detection

4 Basic Knowledge

Edge Algorithm

To use an edge algorithm, you must deploy the algorithm on your edge device. The algorithm analysis tasks will be executed in this device, which eliminates the need to upload video stream data to Huawei Cloud.

Cloud Algorithm

To use a cloud algorithm, video stream data must be uploaded to and analyzed on Huawei Cloud.

Differences Between Edge Algorithms and Cloud Algorithms

Table 4-1 Differences between edge algorithms and cloud algorithms

Type	Function	Run On	Video Data Uploaded To
Edge algorithm	Same	Edge device	Edge device
Cloud algorithm	Same	Huawei Cloud	Huawei Cloud

5 Introduction to Algorithm Packages

This section describes the visual capability packages provided by VIAS and the algorithm services included in the packages.

Visual Capability Packages of Edge Algorithms

To use an edge algorithm, you must deploy the algorithm on your edge device. The algorithm analysis tasks will be executed in this device, which eliminates the need to upload video stream data to Huawei Cloud.

The visual capability packages of edge algorithms include the edge algorithm package for intelligent traffic analysis, professional edge algorithm package, and common edge algorithm package. The following table lists the algorithm services included in each algorithm package.

Table 5-1 Visual capability package – professional edge algorithm package

No.	Included Algorithms	Algorithm Scenario	Description
1	Airport Event Detection (Edge)	Airport event detection	Analyzes video streams to detect and report events outside the airport, including aircraft arrival and departure, cabin door opening and closing, passenger stairs attachment and detachment, and catering truck arrival and departure.
2	Crowd Density Monitoring (Edge)	Crowd gathering detection	Estimates the density of crowds in public places to detect possible social incidents, so that the authority can take prompt measures to prevent potential dangers. If the estimated number of people in an image exceeds a preset threshold (configurable), the algorithm captures images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
3		Outdoor people counting	

No.	Included Algorithms	Algorithm Scenario	Description
4		People in factory exceed capacity	If the number of people in a specified area of a factory exceeds a preset threshold, the algorithm generates an alarm, captures images, and records the occurrence time for case reporting, ensuring factory security.
5	Individual Behavior Detection (Edge)	Detection of smoking in hazardous areas	Analyzes real-time video streams to detect smokers in hazardous areas using the pedestrian detection algorithm and human skeleton key point detection algorithm; continuously tracks and analyzes the object, confirms the specific behavior of the object, and generates an alarm for a confirmed smoker.
6		Phone calling detection	Detects people making phone calls where such behavior is forbidden, such as at gas stations. If such an event is detected, the algorithm captures onsite images and records the occurrence time for further handling.
7	Fight Detection (Edge)	Fight detection	Detects people having a fight with fists or weapons (excluding small confrontation such as clothes grabbing and verbal confrontation). If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
8	Crowd Counting Using High-Altitude Cameras (Edge)	Crowd counting using high-altitude cameras	Analyzes the crowd density of RTSP video streams output by edge cameras. The algorithm triggers alarms based on the alarm mode.
9	Speeding Detection Using High-Altitude Cameras (Edge)	Speeding detection	Estimates the driving speed of a vehicle. When the estimated speed exceeds a specified value, an event is reported.

No.	Included Algorithms	Algorithm Scenario	Description
10	Missing Manhole Cover Detection From a Dynamic Perspective (Edge)	Missing manhole cover detection using UAVs	Detects missing manhole covers from a dynamic perspective. It triggers an alarm if detecting missing manhole covers in the monitored areas.
11	Urban Mobile Trash Detection (Edge)	Mobile trash detection	Detects household wastes (such as plastic bags and leftovers) in places where they do not belong. It triggers an alarm if detecting any household wastes. Vehicle-mounted cameras can be used for such purposes.
12	Target Attribute Recognition (Edge)	Glass wearing detection	Identifies pedestrian attributes such as glasses, hat, gender, approximate age, backpack, handbag, sling bag, tops color, tops style (long or short sleeves), bottoms color, bottoms style, and face orientation in a monitored area, and generates an alarm.
13		Hat wearing detection	
14		Gender detection	
15		Age recognition	
16		Backpack detection	
17		Handbag detection	
18		Sling bag detection	
19		Tops color detection	
20		Long/ short sleeve detection	
21		Bottoms color detection	

No.	Included Algorithms	Algorithm Scenario	Description
22		Bottoms style detection	
23		Face orientation recognition	
24	Individual Action Recognition (Edge)	Climbing detection	Analyzes real-time video streams to detect climbing behavior. Specifically, the algorithm does this by analyzing the body shapes of people across multiple video frames using the human skeleton key point detection algorithm. It helps to improve human and facility safety.
25		Hand waving-for-help detection	Analyzes real-time video streams to detect hand waving-for-help. Specifically, the algorithm does this by analyzing the body shapes of people across multiple video frames using the human skeleton key point detection algorithm. It helps to accelerate emergency response and improve human safety.
26		Fall detection	Detects human falling events in camera footage, such as falling down due to slipping or a health problem. If such events are detected, the algorithm captures onsite images and the occurrence time for case reporting.
27	Shared Bicycle Detection (Edge)	Misparked shared bicycle detection	Detects misparked shared bicycles in a monitored area and generates alarms. The personnel in charge can be notified of parking violations in a timely manner, and public service staff can be assigned to handle problems quickly.
28	Smoke and Fire Detection (Edge)	Waste/ leave burning detection	Detects visible fires (sometimes with heavy smoke), such as the burning of garbage and leaves on city streets or campuses. If such events are detected, the algorithm captures onsite images and the occurrence time for case reporting.
29		Fire detection	Detects visible fires (sometimes with heavy smoke). If such events are detected, the algorithm captures onsite images and the occurrence time for case reporting.
30		Smoke detection	

No.	Included Algorithms	Algorithm Scenario	Description
31		Construction site dust detection	Detects large-scale and strong dust on construction sites. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting, ensuring factory security.
32		Factory hot work environment monitoring	Detects visible fire in hot work environments. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting, ensuring factory security.
33	Trash Can Anomaly Detection (Edge)	Uncovered food waste detection	Detects uncovered food waste in real time. If an uncovered trash can is detected, the algorithm generates an alarm and notifies related personnel to handle the problem.
34	Littering Construction Waste Detection (Edge)	Littering construction waste detection	Detects slag remains that are piled on the streets. The algorithm analyzes videos streams to discover suspected slags on roads and streets. If slag piles are detected, the algorithm captures onsite images with timestamp and records them as evidence for case reporting.
35	Clothes Airing Violation Detection (Edge)	Hanging clothes in public	Detects hanging clothes on telegraph poles or shelves in public. The algorithm analyzes video streams to detect clothes hanging in public. If such an event is detected, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.
36	Missing Manhole Cover Detection (Edge)	Damaged manhole cover detection	Identifies manholes whose covers are broken or missing on streets. The algorithm analyzes video streams. If a manhole whose cover is broken or missing appears in the video, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.
37	Urban Roadside Stall Detection (Edge)	Out-of-store sales detection	Some grocery store owners may sell goods on the sidewalks outside their stores or in front of other stores. This algorithm analyzes videos to find images that include stalls, tables, or chairs at the doors of stores. The algorithm captures target images, records the time, and reports captured images along with other details to the upper-level administrative platform for case reporting.

No.	Included Algorithms	Algorithm Scenario	Description
38		Sidewalk sales detection	Analyzes videos to find images that include illegal sidewalk sales activities. Sidewalk sales include unlicensed business activities such as waste collection on sidewalks or at other public places. If such an activity is detected, the algorithm captures target images, records the time, and reports captured images along with other details to the upper-level platform for case reporting.
39		Unlicensed moving stall detection	
40	Advertisement Violation Detection (Edge)	Immoderate banners detection	Detects banners in a specified monitored area in public places, such as stations, squares, and streets. If immoderate banners are detected, the algorithm generates an alarm so that the banner can be removed in a timely manner. This will help ensure a clean and tidy city outlook.
41	Exposed Bare Soil Detection (Edge)	Exposed bare soil at construction site	Detects construction sites that have a large amount of bare soil uncovered. The algorithm analyzes video streams to detect exposed bare soil. If such an event is detected, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.
42	Messy Piles Detection (Edge)	Messy piles detection	Detects roads and streets for disordered materials, such as timber, sandstone, and crates. The algorithm analyzes video streams to detect improperly piled materials. If such an event is detected, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.
43		Construction waste detection	Detects construction waste such as cement bags and materials at the construction site and generates alarms. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting.
44		Messy piles of building materials detection	Detects messy piles of building materials such as cement bags, wood, and mounds, and generates alarms. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting.

No.	Included Algorithms	Algorithm Scenario	Description
45	Urban Trash Detection (Edge)	Exposed trash detection	Detects packaging waste, exposed trash, and dirty green spaces in public areas. If such domestic waste is detected, the algorithm captures images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
46		Trash overflow detection	
47		Unclean roads detection	
48		Green space maintenance	
49		Unclean riverbank detection	If domestic waste such as garbage bags and water bottles are detected along riverbanks, the algorithm generates an alarm, captures images, and records the occurrence time for case reporting.
50		Littered food waste detection	If littered food waste is detected, the algorithm generates an alarm and notifies related personnel to handle the problem.
51	Overflowing Garbage Can Detection in Cities (Edge)	Overflowing garbage can detection	If an overflowing garbage can is detected, the algorithm captures images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
52	Umbrella Violation Detection (Edge)	Umbrella violation detection	Detects large sunshade umbrellas that are open in public places and affect road traffic and city outlook. If such a large sunshade umbrella is detected, this algorithm captures the images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
53	Vehicle Classification (Edge)	Vehicle classification	Outputs information about vehicles in videos and accurately provides their license plate information based on the specified area. Identifies vehicle types in video footage and reports alarm events and video snapshots with timestamps in a timely manner. Supported vehicle types include cars, dump trucks, cement mixers, trailers, and dump trucks.

No.	Included Algorithms	Algorithm Scenario	Description
54	Vehicle Counting Using High-Altitude Cameras (Edge)	Vehicle counting	Counts the number of vehicles on a road. Periodically reports the number for case reporting.
55	Water Level Gauge Reading (Edge)	Urban flood gauge recognition	Reads water level gauges in urban streets to monitor changes in the volume of water, so that the authority can take prompt measures to prevent floods and waterlogging. Images of the water level readings can be provided for further confirmation by humans. An alarm is generated when the water level exceeds a preset threshold. The water level readings and relevant evidence are saved in a database, and the water level processing module can quickly access such data and generate near real-time water level information at each monitoring point. Such information can be used to support decision-making.
56		River water gauge reading	Reads water level gauges in reservoirs, lakes, and rivers to monitor changes in the volume of water, so that the authority can take prompt measures to prevent floods and waterlogging. Images of the water level readings can be provided for further confirmation by humans. An alarm is generated when the water level exceeds a preset threshold. The water level readings and relevant evidence are saved in a database, and the water level processing module can quickly access such data and generate near real-time water level information at each monitoring point. Such information can be used to support decision-making.
57	Drainage Outlet Monitoring (Edge)	Drainage outlet monitoring	Monitors the flow and discharge content at various drainage or sewage outlets in the city or water systems, for purposes like flood warning, detection of illegal discharging for pollution prevention, and generates alarms based on preset rules.
58	Floating Debris Detection (Edge)	Floating debris detection	Detects floating debris, such as plastic bags and water bottles, on rivers. If such events are detected, the algorithm captures onsite images and the occurrence time for case reporting.

No.	Included Algorithms	Algorithm Scenario	Description
59	Vessel Intrusion Detection (Edge)	Vessel intrusion detection	Detects vessels in specific areas of interest (configurable) in camera footage. If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
60	Waterlogging Detection (Edge)	Standing water detection	Detects standing water on roads in camera-captured images. Standing water is dangerous, so it is important to detect and get rid of standing water as soon as possible. If standing water is detected, this algorithm captures the images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
61		Tunnel waterlogging detection	Detects standing water in tunnels. Standing water is dangerous, so it is important to detect and get rid of standing water as soon as possible. If standing water is detected, this algorithm captures the images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.

Table 5-2 Visual capability package – common edge algorithm package

No.	Included Algorithms	Algorithm Scenario	Description
1	Abandoned Object Detection (Edge)	Abandoned object detection	Recognizes objects (for example, packages and luggage trolleys) left or abandoned in public places such as transport stations and public campuses. Supported object types include packages and trolley cases. If such objects are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
2	Passageway Obstruction Detection (Edge)	Detection of fire access route blockage by vehicles	Detects fire passage blockages and sends alarms with license plates immediately so that the administrative team can handle them in a timely manner. This helps to keep the fire passage clear at all times for fire safety.

No.	Included Algorithms	Algorithm Scenario	Description
3		Detection of fire escape blockages	
4	People Flow Counting (Edge)	People flow counting	Counts the number of people in (or entering and exiting) a certain area of interest during specified periods of time. This algorithm is typically used in campuses or stores to identify the most visited areas, providing insights to better serve both internal and external customers.
5	E-bike Rider Helmet Detection (Edge)	E-bike rider helmet detection	Detects e-bike riders not wearing helmet in streets. If such an event is detected, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.
6	Intrusion Detection (Edge)	People intrusion detection	Detects people and vehicle intrusion in specific areas of interest (configurable) in camera footage. If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
7		Vehicle intrusion detection	
8		Intrusion in ROIs	Detects intrusions in specific areas of interest (configurable) in camera footage. If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
9		Lawn trampling detection	By analyzing video, the algorithm can help check whether there are people who are walking across grass in a specified area. The grass area needs to be configured. If the algorithm identifies lawn trampling behavior, it captures images, records the occurrence time, and produces captured images as evidence.
10		Factory intrusion detection	Detects intrusion events in key areas and dangerous areas in a factory. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting, ensuring factory security.

No.	Included Algorithms	Algorithm Scenario	Description
11	Non-motorized Vehicle Detection (Edge)	Detection of misparked non-motorized vehicle	Detects non-motorized vehicles parking outside the designated areas in camera footage. If such an event is detected, the algorithm further checks the length of time of the parking violation, records images and the occurrence time, generates an alarm, and sends the recorded information to the upper-level platform for further handling.
12		Detection of non-motorized vehicle	Detects non-motorized vehicles that appear in places where non-motorized vehicles are not allowed. The algorithm selects areas where non-motorized vehicles should not be parked. If non-motorized vehicles are detected in those areas, this algorithm further records images and the time, generates an alarm, and reports the recorded information to the upper-level platform so that the platform can generate case with received evidence.
13		E-bike-in-building detection	Detects e-bikes in staircases or elevators. The algorithm selects areas where e-bikes should not be parked. If e-bikes are detected in those areas, this algorithm further records images and the time, generates an alarm, and reports the recorded information to the upper-level platform so that the platform can generate case with received evidence.
14		Non-motorized vehicles lane violation	Detects non-motorized vehicles occupying motor vehicle lanes in a monitored area. If such events are detected, an alarm is generated and relevant departments can be notified in a timely manner to handle problems quickly.
15	Wrong-Way Driving Detection (Edge)	Wrong-way driving detection	Detects wrong-way driving events. If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
16	Safety Suite Detection (Edge)	No-workwear detection	Detects workers who are not wearing safety helmets or reflective clothing when working in potentially hazardous positions and generates warnings when such events are detected. This helps to improve worker safety in factories, construction sites, and many other places. It also helps to improve workers' safety awareness.
17		No-safety helmet detection	

No.	Included Algorithms	Algorithm Scenario	Description
18	Staff On-Duty Detection (Edge)	Employee absence detection	The algorithm does this by counting the number of people in specific areas of interest captured in camera footage. If the number of people detected is less than the preset number (configurable), this algorithm determines that some employees working at key positions are off duty when they are not supposed to. When such an event is detected, this algorithm automatically records original images and the occurrence time, and generates an alarm.
19	Abnormal Parking Detection (Edge)	Motor vehicle parking violation	Detects motor vehicles parking outside the designated areas for a time that exceeds the allowed period. If such an event is detected, the algorithm further checks the length of time of the parking violation, records images and the occurrence time, generates an alarm, and sends the recorded information to the upper-level platform for further handling.
20	Vehicle Detection (Edge)	License plate detection	Outputs information about vehicles in videos and accurately provides their license plate information based on the specified ROI.
21	Mask Wearing Detection (Edge)	Mask wearing detection	Detects people who do not wear masks in a monitored area and generates alarms. If such a person is detected, the algorithm generates an alarm and this person will be denied entry. Alternatively, related personnel will be sent to handle the problem.

Visual Capability Packages of Cloud Algorithms

To use a cloud algorithm, video stream data must be uploaded to and analyzed on the cloud.

The visual capability packages of cloud algorithms include the professional cloud algorithm package and common cloud algorithm package. The following table lists the algorithm services included in each package.

Table 5-3 Visual capability package – professional cloud algorithm package

No.	Algorithm Services	Algorithm Scenario	Description
1	Airport Event Detection (Cloud)	Airport event detection	Analyzes video streams to detect and report events outside the airport, including aircraft arrival and departure, cabin door opening and closing, passenger stairs attachment and detachment, and catering truck arrival and departure.
2	Crowd Density Monitoring (Cloud)	Crowd gathering detection	Estimates the density of crowds in public places to detect possible social incidents, so that the authority can take prompt measures to prevent potential dangers. If the estimated number of people in an image exceeds a preset threshold (configurable), the algorithm captures images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
3		Outdoor people counting	
4		People in factory exceed capacity	If the number of people in a specified area of a factory exceeds a preset threshold, the algorithm generates an alarm, captures images, and records the occurrence time for case reporting, ensuring factory security.
5	Individual Behavior Detection (Cloud)	Detection of smoking in hazardous areas	Analyzes real-time video streams to detect smokers in hazardous areas using the pedestrian detection algorithm and human skeleton key point detection algorithm; continuously tracks and analyzes the object, confirms the specific behavior of the object, and generates an alarm for a confirmed smoker.
6		Phone calling detection	Detects people making phone calls where such behavior is forbidden, such as at gas stations. If such an event is detected, the algorithm captures onsite images and records the occurrence time for further handling.
7	Crowd Counting Using High-Altitude Cameras (Cloud)	Crowd counting using high-altitude cameras	Analyzes the crowd density of RTSP video streams output by edge cameras. The algorithm triggers alarms based on the alarm mode.

No.	Algorithm Services	Algorithm Scenario	Description
8	Fight Detection (Cloud)	Fight detection	Detects people having a fight with fists or weapons (excluding small confrontation such as clothes grabbing and verbal confrontation). If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
9	Crowd Counting Using High-Altitude Cameras (Cloud)	Crowd counting using high-altitude cameras	Analyzes the crowd density of RTSP video streams output by edge cameras. The algorithm triggers alarms based on the alarm mode.
10	Speeding Detection Using High-Altitude Cameras (Cloud)	Speeding detection	Estimates the driving speed of a vehicle. When the estimated speed exceeds a specified value, an event is reported.
11	Wrong-Way Driving Detection Using High-Altitude Cameras (Cloud)	Wrong-way driving detection	Detects wrong-way driving events. If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
12	Missing Manhole Cover Detection From a Dynamic Perspective (Edge)	Missing manhole cover detection from a dynamic perspective	Detects missing manhole covers from a dynamic perspective. It triggers an alarm if detecting missing manhole covers in the monitored areas.
13	Target Attribute Recognition (Cloud)	Glass wearing detection	Identifies pedestrian attributes such as glasses, hat, gender, approximate age, backpack, handbag, sling bag, tops color, tops style (long or short sleeves), bottoms color, bottoms style, and face orientation in a monitored area, and generates an alarm.
14		Hat wearing detection	
15		Gender detection	

No.	Algorithm Services	Algorithm Scenario	Description
16		Age recognition	
17		Backpack detection	
18		Handbag detection	
19		Sling bag detection	
20		Tops color detection	
21		Long/short sleeve detection	
22		Bottoms color detection	
23		Bottoms style detection	
24		Face orientation recognition	
25	Individual Action Recognition (Cloud)	Climbing detection	Analyzes real-time video streams to detect climbing behavior. Specifically, the algorithm does this by analyzing the body shapes of people across multiple video frames using the human skeleton key point detection algorithm. It helps to improve human and facility safety.
26		Hand waving-for-help detection	Analyzes real-time video streams to detect hand waving-for-help. Specifically, the algorithm does this by analyzing the body shapes of people across multiple video frames using the human skeleton key point detection algorithm. It helps to accelerate emergency response and improve human safety.

No.	Algorithm Services	Algorithm Scenario	Description
27		Fall detection	Detects human falling events in camera footage, such as falling down due to slipping or a health problem. If such events are detected, the algorithm captures onsite images and the occurrence time for case reporting.
28	Shared Bicycle Detection (Cloud)	Misparked shared bicycle detection	Detects misparked shared bicycles in a monitored area and generates alarms. The personnel in charge can be notified of parking violations in a timely manner, and public service staff can be assigned to handle problems quickly.
29	Smoke and Fire Detection (Cloud)	Waste/ leave burning detection	Detects visible fires (sometimes with heavy smoke), such as the burning of garbage and leaves on city streets or campuses. If such events are detected, the algorithm captures onsite images and the occurrence time for case reporting.
30		Fire detection	Detects visible fires (sometimes with heavy smoke). If such events are detected, the algorithm captures onsite images and the occurrence time for case reporting.
31		Smoke detection	
32		Construction site dust detection	Detects large-scale and strong dust on construction sites. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting, ensuring factory security.
33		Factory hot work monitoring	Detects visible fire during hot work. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting, ensuring factory security.
34	Trash Can Anomaly Detection (Cloud)	Uncovered food waste detection	Detects uncovered food waste in real time. If an uncovered trash can is detected, the algorithm generates an alarm and notifies related personnel to handle the problem.
35	Littering Construction Waste Detection (Cloud)	Littering construction waste detection	Detects slag remains that are piled on the streets. The algorithm analyzes videos streams to discover suspected slags on roads and streets. If slag piles are detected, the algorithm captures onsite images with timestamp and records them as evidence for case reporting.

No.	Algorithm Services	Algorithm Scenario	Description
36	Clothes Airing Violation Detection (Cloud)	Hanging clothes in public	Detects hanging clothes on telegraph poles or shelves in public. The algorithm analyzes video streams to detect clothes hanging in public. If such an event is detected, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.
37	Missing Manhole Cover Detection (Edge)	Damaged manhole cover detection	Identifies manholes whose covers are broken or missing on streets. The algorithm analyzes video streams. If a manhole whose cover is broken or missing appears in the video, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.
38	Urban Roadside Stall Detection (Cloud)	Out-store sales detection	Some grocery store owners may sell goods on the sidewalks outside their stores or in front of other stores. This algorithm analyzes videos to find images that include stalls, tables, or chairs at the doors of stores. The algorithm captures target images, records the time, and reports captured images along with other details to the upper-level administrative platform for case reporting.
39		Sidewalk sales detection	Analyzes videos to find images that include illegal sidewalk sales activities. Sidewalk sales include unlicensed business activities such as waste collection on sidewalks or at other public places. If such an activity is detected, the algorithm captures target images, records the time, and reports captured images along with other details to the upper-level platform for case reporting.
40		Unlicensed moving stall detection	
41	Advertisement Violation Detection (Cloud)	Immoderate banners detection	Detects banners in a specified monitored area in public places, such as stations, squares, and streets. If immoderate banners are detected, the algorithm generates an alarm so that the banner can be removed in a timely manner. This will help ensure a clean and tidy city outlook.
42	Exposed Bare Soil Detection (Cloud)	Exposed bare soil at construction site	Detects construction sites that have a large amount of bare soil uncovered. The algorithm analyzes video streams to detect exposed bare soil. If such an event is detected, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.

No.	Algorithm Services	Algorithm Scenario	Description
43	Messy Piles Detection (Cloud)	Messy piles detection	Detects roads and streets for disordered materials, such as timber, sandstone, and crates. The algorithm analyzes video streams to detect improperly piled materials. If such an event is detected, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.
44		Construction waste detection	Detects construction waste such as cement bags and materials at the construction site and generates alarms. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting.
45		Messy piles of building materials detection	Detects messy piles of building materials such as cement bags, wood, and mounds, and generates alarms. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting.
46	Urban Trash Detection (Cloud)	Exposed trash detection	Detects packaging waste, exposed trash, and dirty green spaces in public areas. If such domestic waste is detected, the algorithm captures images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
47		Trash overflow detection	
48		Unclean roads detection	
49		Green space maintenance	
50		Unclean riverbank detection	If domestic waste such as garbage bags and water bottles are detected along riverbanks, the algorithm generates an alarm, captures images, and records the occurrence time for case reporting.
51		Littered food waste detection	If littered food waste is detected, the algorithm generates an alarm and notifies related personnel to handle the problem.

No.	Algorithm Services	Algorithm Scenario	Description
52	Overflowing Garbage Can Detection in Cities (Edge)	Overflowing garbage can detection	If an overflowing garbage can is detected, the algorithm captures images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
53	Umbrella Violation Detection (Cloud)	Umbrella violation detection	Detects large sunshade umbrellas that are open in public places and affect road traffic and city outlook. If such a large sunshade umbrella is detected, this algorithm captures the images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
54	Vehicle Classification (Cloud)	Vehicle classification	Outputs information about vehicles in videos and accurately provides their license plate information based on the specified area. Identifies vehicle types in video footage and reports alarm events and video snapshots with timestamps in a timely manner. Supported vehicle types include cars, dump trucks, cement mixers, trailers, and dump trucks.
55	Vehicle Counting Using High-Altitude Cameras (Cloud)	Vehicle counting	Counts the number of vehicles on a road. Periodically reports the number for case reporting.
56	Water Level Gauge Reading (Cloud)	Urban flood gauge recognition	Reads water level gauges in urban streets to monitor changes in the volume of water, so that the authority can take prompt measures to prevent floods and waterlogging. Images of the water level readings can be provided for further confirmation by humans. An alarm is generated when the water level exceeds a preset threshold. The water level readings and relevant evidence are saved in a database, and the water level processing module can quickly access such data and generate near real-time water level information at each monitoring point. Such information can be used to support decision-making.

No.	Algorithm Services	Algorithm Scenario	Description
57		River water gauge reading	Reads water level gauges in reservoirs, lakes, and rivers to monitor changes in the volume of water, so that the authority can take prompt measures to prevent floods and waterlogging. Images of the water level readings can be provided for further confirmation by humans. An alarm is generated when the water level exceeds a preset threshold. The water level readings and relevant evidence are saved in a database, and the water level processing module can quickly access such data and generate near real-time water level information at each monitoring point. Such information can be used to support decision-making.
58	Drainage Outlet Monitoring (Cloud)	Drainage outlet monitoring	Monitors the flow and discharge content at various drainage or sewage outlets in the city or water systems, for purposes like flood warning, detection of illegal discharging for pollution prevention, and generates alarms based on preset rules.
59	Floating Debris Detection (Cloud)	Floating debris detection	Detects floating debris, such as plastic bags and water bottles, on rivers. If such events are detected, the algorithm captures onsite images and the occurrence time for case reporting.
60	Vessel Intrusion Detection (Cloud)	Vessel intrusion detection	Detects vessels in specific areas of interest (configurable) in camera footage. If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
61	Waterlogging Detection (Cloud)	Standing water detection	Detects standing water on roads in camera-captured images. Standing water is dangerous, so it is important to detect and get rid of standing water as soon as possible. If standing water is detected, this algorithm captures the images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.
62		Tunnel waterlogging detection	Detects standing water in tunnels. Standing water is dangerous, so it is important to detect and get rid of standing water as soon as possible. If standing water is detected, this algorithm captures the images, records the occurrence time, and sends the captured images along with other details to the upper-level platform for case reporting.

Table 5-4 Visual capability package – common cloud algorithm package

No.	Algorithm Services	Algorithm Scenario	Description
1	Abandoned Object Detection (Cloud)	Abandoned object detection	Recognizes objects (for example, packages and luggage trolleys) left or abandoned in public places such as transport stations and public campuses. Supported object types include packages and trolley cases. If such objects are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
2	Fire Passage Obstruction Detection (Cloud)	Detection of fire access route blockage by vehicles	Detects fire passage blockages and sends alarms with license plates immediately so that the administrative team can handle them in a timely manner. This helps to keep the fire passage clear at all times for fire safety.
3		Detection of fire escape blockages	
4	People Flow Counting (Cloud)	People flow counting	Counts the number of people in (or entering and exiting) a certain area of interest during specified periods of time. This algorithm is typically used in campuses or stores to identify the most visited areas, providing insights to better serve both internal and external customers.
5	E-bike Rider Helmet Detection (Cloud)	E-bike rider helmet detection	Detects e-bike riders not wearing helmet in streets. If such an event is detected, the algorithm captures onsite images with timestamps and records them as evidence for case reporting.
6	Intrusion Detection (Cloud)	People intrusion detection	Detects people and vehicle intrusion in specific areas of interest (configurable) in camera footage. If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
7		Vehicle intrusion detection	
8		People intrusion in ROIs	Detects people intrusion in specific areas of interest (configurable) in camera footage. If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.

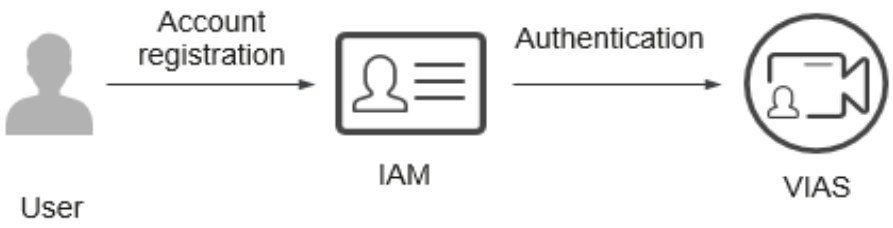
No.	Algorithm Services	Algorithm Scenario	Description
9		Lawn trampling detection	By analyzing video, the algorithm can help check whether there are people who are walking across grass in a specified area. The grass area needs to be configured. If the algorithm identifies lawn trampling behavior, it captures images, records the occurrence time, and produces captured images as evidence.
10		Factory intrusion detection	Detects intrusion events in key areas and dangerous areas in a factory. If such events are detected, the algorithm generates an alarm, captures onsite images, and records the occurrence time for case reporting, ensuring factory security.
11	Non-motorized Vehicle Detection (Cloud)	Detection of misparked non-motorized vehicle	Detects non-motorized vehicles parking outside the designated areas in camera footage. If such an event is detected, the algorithm further checks the length of time of the parking violation, records images and the occurrence time, generates an alarm, and sends the recorded information to the upper-level platform for further handling.
12		Detection of non-motorized vehicle	Detects non-motorized vehicles that appear in places where non-motorized vehicles are not allowed. The algorithm selects areas where non-motorized vehicles should not be parked. If non-motorized vehicles are detected in those areas, this algorithm further records images and the time, generates an alarm, and reports the recorded information to the upper-level platform so that the platform can generate case with received evidence.
13		E-bike-in-building detection	Detects e-bikes in staircases or elevators. The algorithm selects areas where e-bikes should not be parked. If e-bikes are detected in those areas, this algorithm further records images and the time, generates an alarm, and reports the recorded information to the upper-level platform so that the platform can generate case with received evidence.
14		Non-motorized vehicles lane violation	Detects non-motorized vehicles occupying motor vehicle lanes in a monitored area. If such events are detected, an alarm is generated and relevant departments can be notified in a timely manner to handle problems quickly.

No.	Algorithm Services	Algorithm Scenario	Description
15	Wrong-Way Driving Detection (Edge)	Wrong-way driving detection	Detects wrong-way driving events. If such events are detected, the algorithm captures onsite images and records the occurrence time for case reporting.
16	Safety Suite Detection (Cloud)	No-workwear detection	Detects workers who are not wearing safety helmets or reflective clothing when working in potentially hazardous positions and generates warnings when such events are detected. This helps to improve worker safety in factories, construction sites, and many other places. It also helps to improve workers' safety awareness.
17		No-safety helmet detection	
18	Staff On-Duty Detection (Cloud)	Employee absence detection	The algorithm does this by counting the number of people in specific areas of interest captured in camera footage. If the number of people detected is less than the preset number (configurable), this algorithm determines that some employees working at key positions are off duty when they are not supposed to. When such an event is detected, this algorithm automatically records original images and the occurrence time, and generates an alarm.
19	Abnormal Parking Detection (Cloud)	Motor vehicle parking violation	Detects motor vehicles parking outside the designated areas for a time that exceeds the allowed period. If such an event is detected, the algorithm further checks the length of time of the parking violation, records images and the occurrence time, generates an alarm, and sends the recorded information to the upper-level platform for further handling.
20	Vehicle Detection (Cloud)	Vehicle detection on the cloud	Analyzes RTSP video streams from edge cameras, outputs information about vehicles in videos, and accurately provides their license plate information based on the specified ROI.
21	Mask Wearing Detection (Cloud)	Mask wearing detection	Detects people who do not wear masks in a monitored area and generates alarms. If such a person is detected, the algorithm generates an alarm and this person will be denied entry. Alternatively, related personnel will be sent to handle the problem.

6 Related Services

The following figure shows the relationship between VIAS and IAM.

Figure 6-1 Relationship between VIAS and IAM



IAM

VIAS uses **Identity and Access Management (IAM)** for authentication and authorization.

DIS

VIAS transmits analysis results to **Data Ingestion Service (DIS)** in the format of structured data.

IEF

VIAS delivers analysis jobs to edge nodes managed by Intelligent EdgeFabric (IEF) and analyzes camera video data in real time.

7 Constraints and Limitations

VIAS has certain constraints and limitations, some cost-related and some technological. System-wide constraints affect all sub-services. Additionally, sub-services are subject to their respective constraints.

System-Wide Constraints

- Supported video formats include AVI, WMV, MPG, MPEG, MP4, MOV, M4V, and MKV.
- Supported frame rates include 12, 24, 25, and 30 fps.
- Decoding is supported for H.264 and H.265 videos.

Encoding Format	Resolution
H.264	720P, 1080P, 2K, 4K
H.265	720P, 1080P, 2K, 4K

Constraints of Algorithm Services on Cameras

Table 7-1 Constraints

Object	Constraint
Camera installation height and angle	• Camera installation height: 3 m to 5 m • Tilted angle: 10° to 40°

Object	Constraint
Lighting and orientation	• Adequate lighting at night or in poorly lit indoor environments is required, so that targets are clearly visible in video footage. • Avoid direct exposure to strong light. After installation is complete, make sure the camera lens is not exposed to harsh light, such as sunlight or street lamps. • Avoid light reflections. Keep the camera away from highly reflective objects such as glass, ceramic tiles, water, leaves, signboards, and advertisements.
Camera resolution and image quality	• The camera resolution should be at least 1080p. • The video footage must be clear and free from artifacts and overexposure.
Camera installation location	• The detection area must not have objects (such as trees) blocking the camera's line of sight. • The location must meet the installation requirements (for example, poles and walls are available for camera installation).

Constraints and Recommendations on Edge Node Servers

Edge nodes where VIAS is running support Ascend and x86+GP Tnt004 servers.

- To use Ascend servers, Atlas 800 AI server (model 3000) is recommended.
  - VIAS supports the c82 driver of Ascend inference chip (download path: **c82 driver**). If the Ascend chip driver of the current server is not of the c82 version, install the c82 driver.
  - On edge node servers, the default ID of the Ascend driver user group **HwHiAiUser** is **1001**. Do not change the value. Otherwise, algorithm jobs may run abnormally. The ID of the **HwHiAiUser** user group supported by VIAS is **1001**, **1000**, or **10001**.
- To use x86+GP Tnt004 servers, RH2288 V5 and Atlas G5500 are recommended. CentOS 7.x is recommended for the server operating system. If Tnt004 servers are used, download the recommended **Tnt004 driver version**.

Table 7-2 Recommended server type

Server Model	Description	NPU/GP
Atlas 800 AI server (model 3000)	CPU: 2 x Kunpeng 920 5220 Memory: 256 GB DDR4 Hard disk: 2 x 480 GB SATA-SSD + RAID 0/1/5 Atlas 300I Pro: up to eight cards supported NIC: 2 x dual-port 25GE NIC (Mellanox CX4)	Altas 300I Pro
Atlas G5500	Operating system: CentOS 7.x/ Ubuntu 18.04/Ubuntu 16.04/ RHEL 7.x (CentOS 7.x is recommended.) CPU: two Intel® Xeon® SkyLake 6161 v5 CPUs Memory: 128 GB Hard disk: 2 x 1.2 TB (RAID1) system disk + 1 x 500 GB data disk Graphics card (Tnt004): up to eight cards supported (The server supports a maximum of 16 graphics cards. However, only eight graphics cards are supported due to the limitation of CPU cores.) NIC: 2 x 10GE	GP Tnt004

Server Model	Description	NPU/GP
RH2288H V5	Operating system: CentOS 7.x/ Ubuntu 16.04/RHEL 7.x (CentOS 7.x is recommended.) CPU: two Intel® Xeon® Gold 6154 CPUs Memory: 64 GB Hard disk: 2 x 600 GB (RAID1) system disk + 1 x 500 GB data disk Graphics card (Tnt004): up to two cards supported NIC: 2 * GE	GP Tnt004

8 Billing

Billing Modes

VIAS provides a series of visual capability algorithm packages. You can purchase algorithm packages based on service requirements and use the yearly or monthly billing mode.

Changing the Billing Mode

VIAS does not support billing mode changes. Make sure to purchase a package that fits your requirements.

Renewal

After a package expires, you can renew the package to extend its validity period. Alternatively, you can select auto-renew upon expiration when purchasing a package. For details about renewal operations, see **Renewal Management**.

Expiration and Overdue Payment

After a monthly or yearly package expires and if your account is in arrears, a grace period and a retention period will be granted. Such periods depend on the customer tier and subscription type. Resources cannot be accessed during these periods. If the account is not topped up or the resource package is not renewed before the retention period expires, your data will be deleted and cannot be recovered.

