GIGABYTE™

An Intelligent Video Analytics Platform for Smart Cities

Gorilla

GIGABYTE has partnered with Gorilla Technology Group to deliver an Intelligent Video Analytics Solution, using AI to implement facial, vehicle and behavior recognition technology of video streams from CCTV cameras in order to deliver business intelligence, security and safety solutions for both private enterprises and public organizations.

INTRODUCTION

In 1950, the fishing village of Shenzhen in south-east China had 3,148 inhabitants. By 2025 it is predicted that number will exceed 12 million. In 1900 just 14 percent of people on earth lived in cities[1] but today over 55% of the world's population lives in urban areas, and the rate continues to grow. The UN predicts that by 2050 the percentage of people living in urban areas will edge closer to 70%[2].

Improving cities is a pressing global need as the world's population grows and our species becomes rapidly more urbanized. Thanks to the relative ease with which local governments can now gather real time data, combined with the capabilities of artificial intelligence, cities can now realize new ways to run more efficiently and effectively.

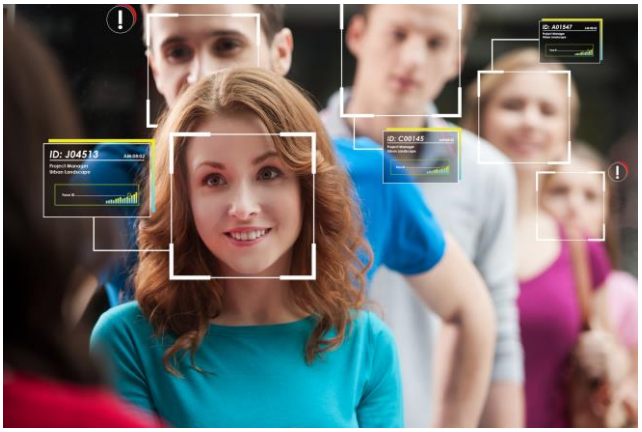
Using Intelligent Video Analytics to Create a Smart City

Almost all major cities now have a network of CCTV cameras installed, both in and around public installations (such as airports, train stations) as well as on the roadside to monitor traffic. NVIDIA predicts that by 2020 there will be 1 billion cameras deployed on government property, infrastructure, and on commercial buildings[3].

Not only is the number of CCTV cameras increasing, but also the quality and resolution. IHS MARKIT predicts that by 2022, up to 60% of CCTV cameras shipped worldwide will have a resolution of 4 megapixels or higher, resulting in a marked increase in the quality of useable video[4]. This huge source of raw video has a massive potential to be used more effectively to provide intelligence to local governments and business in order to improve public & customer safety, security and convenience.

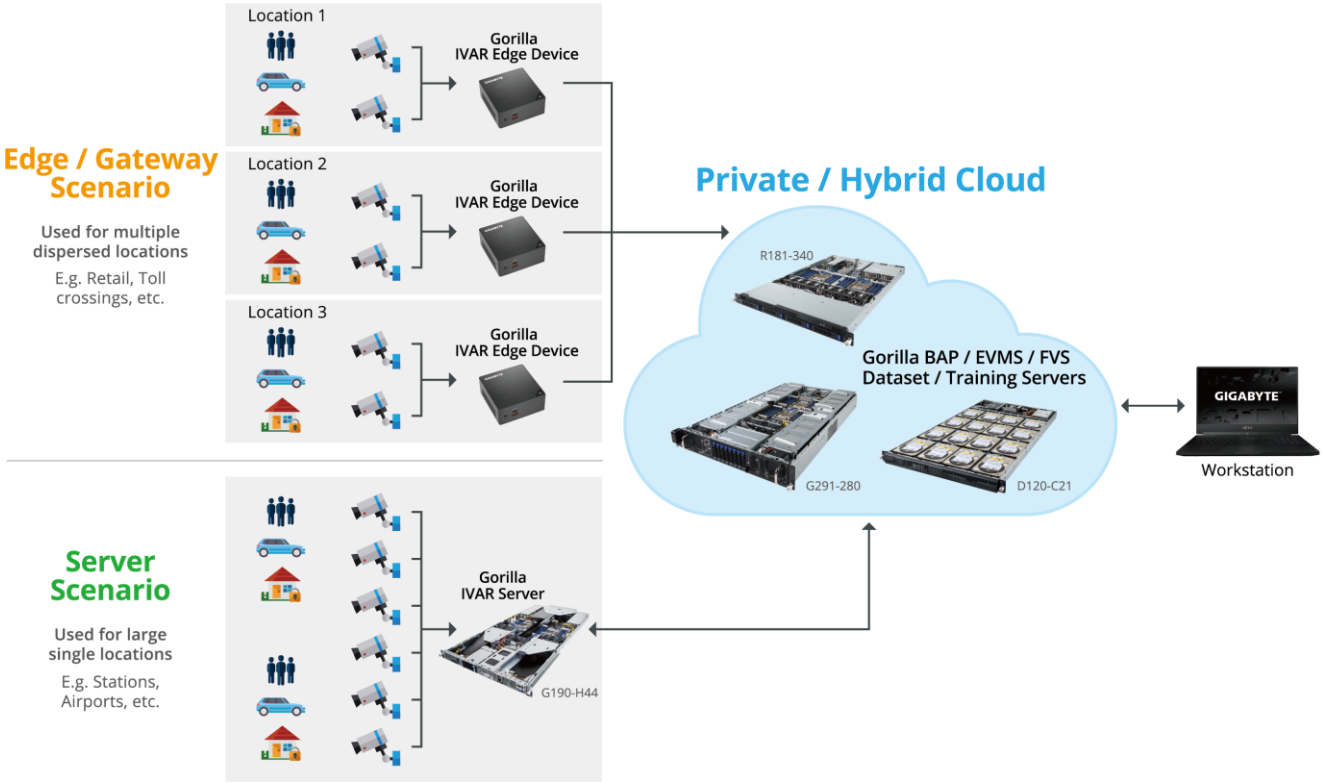
However, the huge increase in raw video means that it will become impossible for most footage to be viewed live or after the fact by human operators. For example, manually reviewing 1 hour of video can take up to 2 – 2.5 hours[4]. Most video is then either deleted permanently or archived without being used for any meaningful analysis.

Advances in artificial intelligence mean that applications can now take on image recognition capabilities that allow them to detect and identify human faces, vehicle registration plates, and other objects. An intelligent video analysis platform can be used to **recognize faces, license plates and objects (and compare them with a database for matching)** and **track the speed and movements of people and vehicles to establish patterns**.



Furthermore, by using **machine learning**, video analysis and image recognition can become faster and more accurate over time. The more often a computer performs this sort of analysis, the more capable it becomes of correctly identifying and tagging other images in the future. Larger datasets lead to more accurate results, and feedback loops help eliminate errors.

SOLUTION OVERVIEW

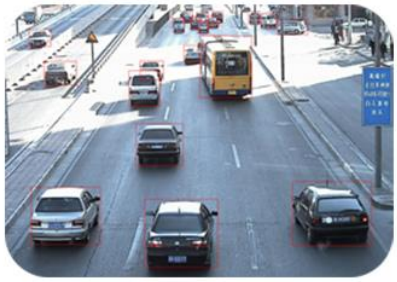


Gorilla's IVAR (Intelligent Video Analytics Recorder)

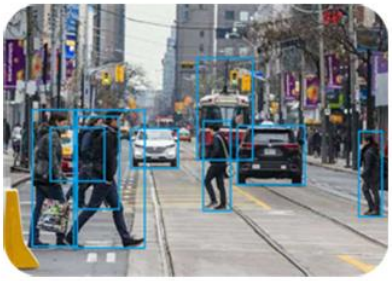
Gorilla's Intelligent Video Analytics Recorder (IVAR) solution extracts surveillance video insights and delivers actionable **facial, vehicle and object identification** results for government and commercial entities. Compatible with industry protocols and standards like ONVIF, RTSP and H.264, this solution can be deployed on edge devices connected to video cameras, or integrated directly into devices with built-in cameras. Gorilla's IVAR offers value-added applications in different verticals like public safety, industry, retail, banking and education and provides advanced dataset services for cloud servers.

Market-ready Video Analytics Algorithms

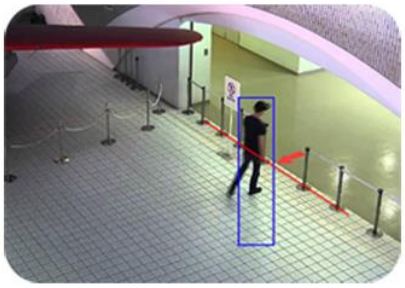
People/Face Recognition



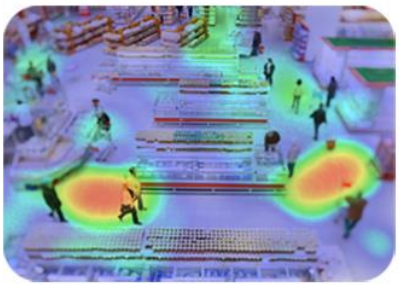
Vehicle Detection/Recognition



Object Detection/Classification



Behavior Analysis



Business Intelligence

Gorilla's IVAR also utilizes Intel's **OpenVINO™** (Open Visual Inference & Neural Network Optimization) toolkit. Based on convolutional neural networks (CNN), the toolkit extends workloads across Intel® hardware and maximizes performance. **OpenVINO™** allows Gorilla's IVAR to increase performance by 50%, enabling edge devices to conduct 1½ times more video feeds in real-time analytics. Gorilla's clients will dramatically benefit from lower deployment costs as more video channels can analyzed on the same hardware.

- Facial, license plate & object recognition in real-time
- Up to 16 analytics channels on an IVAR server platform using **GIGABYTE's G190-H44** server
- Real-time alerts & post-event analytics

Gorilla's Backend Application Suite

Gorilla's provides a suite of powerful backend applications which can be run on a public, private or hybrid cloud. Video streams are collected on Gorilla IVAR edge devices or edge servers for preprocessing and then forwarded for analysis. Here, unstructured video and image data is transformed into structured data via deep learning. Events are stored in software defined storage and correlated and categorized for use in biometric authentication, account management, device management, and business intelligence.

BAP (Biometric Authentication Provider)

- The BAP is a database of personal profiles with images, that verifies personal identities via facial images captured from the IVAR edge device / server
- **Client-server mode**: facial recognition is conducted on the BAP server. Then, the result is pushed to the edge device for the further action, e.g. granting entrance access.
- **Client mode**: the BAP database is synchronized with edge devices / servers to enable facial recognition functions on the edge.

EVMS (Event and Video Management System)

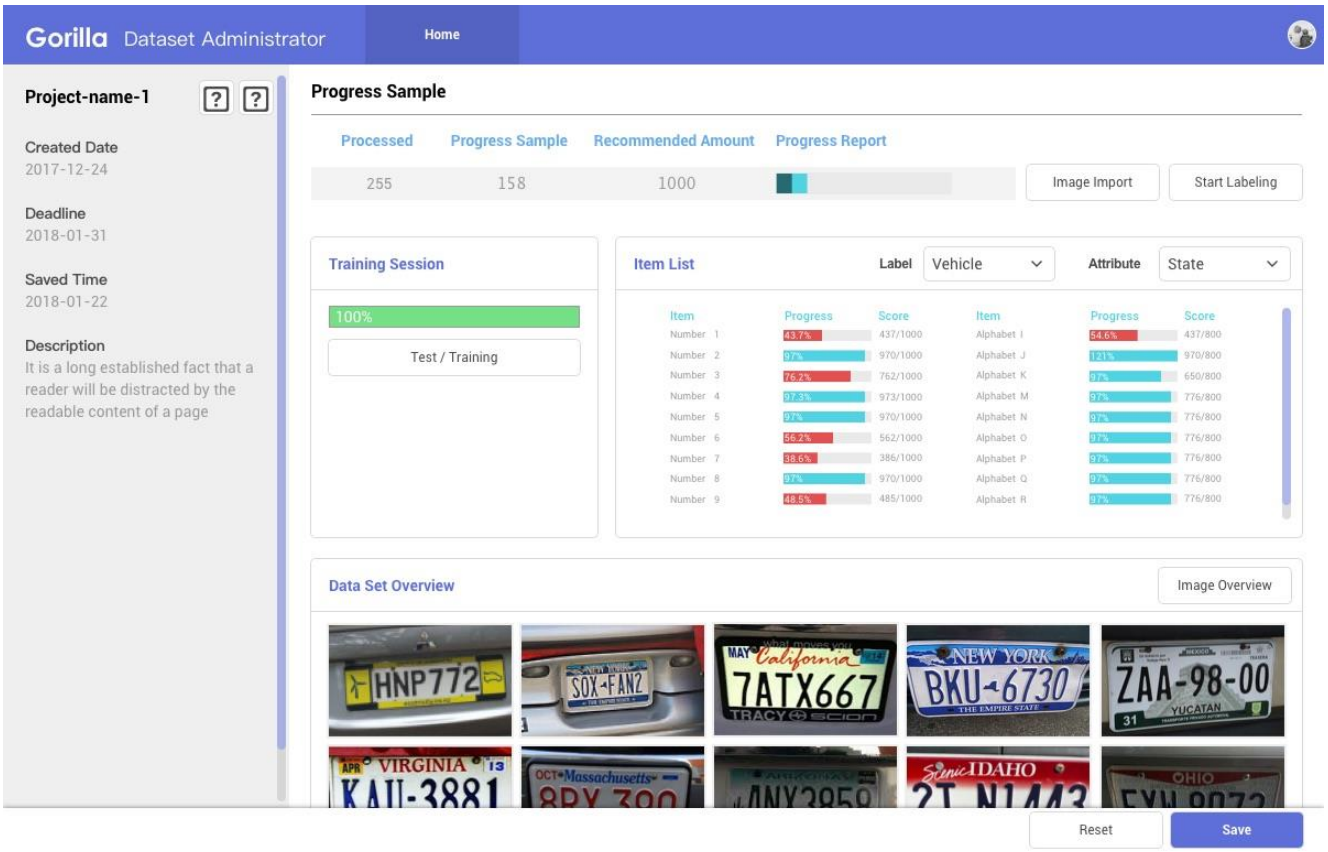
- Manage IVAR devices, video channels, and IVA events
- Store event logs for archived search

FVS Fast Video Search

- Identify human faces or vehicle registration plates from IVAR's live streaming or uploaded H.264/MPEG 4 files, and store into an EVMS database.
- View captured face / vehicle images from selected time periods and locations.
- Search people or vehicles different attributes. E.g. eyewear, clothes color, car type etc.

Dataset & Training Service

- Store and archive sample images collected from Gorilla's IVAR with object attribute information e.g. gender, age, license plate.
- Use these images as a subset to generate new machine learning algorithms.
- For example, use a filter tool to select relevant samples (US license plates) and manually label California license plate images.
- Then, use those labeled images to train new deep learning models to recognize California license plates.



ABOVE: SCREENSHOT FROM GORILLA'S DATASET & TRAINING SERVICE

GIGABYTE Server Hardware

Gorilla has qualified and recommends the following GIGABYTE servers for an Intelligent Video Analytics Platform turnkey solution:

GIGABYTE G190-H44 for Gorilla's IVAR Server

GIGABYTE's G190-144 is an ideal compact form factor GPU server, providing a capacity of 4 x GPU cards in a 1U form factor, ideal for inferencing purposes of multiple video streams.

G190-H44

GPU	Supports up to 4 x double slot GPU/MIC cards NVIDIA® validated GPU platform
CPU	Intel® Xeon® processor E5-2600 V3 / V4 product families
Memory	16 x RDIMM/LRDIMM ECC DDR4 DIMM slots
Networking	2 x GbE LAN ports (Intel® I350-AM2)
Storage	2 x 2.5" + 2 x 1.8" fixed internal HDD/SSD bays
Expansion	2 x Full-length low-profile slots - 1 x PCI-e x16 slot (Gen3 x8 bus) - 1 x PCI-e x8 slot (Gen3 x8 bus) 4 x Full-length full-height x16 slots (Gen3 x16 bus)
Management	1 x dedicated management port Aspeed® AST2400 remote management controller
Power	80 PLUS Platinum 2000W redundant PSU

GIGABYTE R181-340 and D120-C21 for Gorilla's EVMS / FVS / BAP

The R181-340 rack server combined with the D120-C21 storage server is an ideal cost and performance efficient solution for hosting the back-end applications of an Intelligent Video Analytics Solution.

	 **R181-340**	 **D120-C21**
CPU	Intel® Xeon® Processor Scalable Family	Intel® Xeon® processor D-1541
Memory	6-Channel RDIMM/LRDIMM DDR4, 24 x DIMMs	4 x DIMM slots, Dual channel, DDR4 2400/2133/1866/1600MHz
Networking	Dual 1Gb/s LAN ports	2 x 10GbE SFP+ LAN ports + 2 x GbE LAN ports
Storage	4 x 3.5"/2.5" SATAIII hot-swappable HDD/SSD bays 1 x 2.5" internal fixed HDD/SSD bay, 2 x 2.5" HDD/SSD kits as an option	16 x 3.5" HDD slots Supports SATA III 6Gb/s via LSI SAS3216 controller Supports software RAID 0,1,1E,10
Expansion	3 x PCIe Gen3 expansion slots 2 x OCP Gen3 x16 mezzanine slots	
Management	1 x dedicated management port Aspeed® AST2500 remote management controller	1 x dedicated management port Aspeed® AST2400 management controller
Power	Dual 1200W 80 PLUS Platinum redundant / hot-swap power supply	1 x 400W 80 PLUS Gold 100~240V AC PSU

GIGABYTE G291-280 for Gorilla's Dataset & Training Service

The G291-280 combines GIGABYTE's expertise in thermal and mechanical engineering to provide an industry leading density of 8 x GPU cards in a 2U form factor server. The G291-280 combines GPU capabilities with dual Intel Xeon Scalable processors up to a maximum TDP of 205W, and support for both Intel Optane DC Persistent Memory (with up to 512GB per module) and Intel Omni-Path technologies, making it an efficient and powerful platform for machine learning applications.

G291-280

GPU	Up to 8 x double slot GPU cards NVIDIA® validated GPU platform; Support for NVIDIA® Tesla® GPUs
CPU	Intel® Xeon® Processor Scalable Family up to 205W TDP
Memory	6-Channel RDIMM/LRDIMM DDR4, 24 x DIMMs Support for Intel DC Optane Persistent Memory
Networking	2 x 10Gb/s BASE-T LAN ports
Storage	8 x 2.5" hot-swappable HDD/SSD bays
Expansion	8 x PCIe Gen3 expansion slots for GPUs 2 x PCIe x16 Half-length low-profile slots for add-on cards
Management	1 x dedicated management port Aspeed® AST2500 remote management controller
Power	Dual 2200W 80 PLUS Platinum redundant / hot-swap power supply

USE CASE EXAMPLES

1. International Airport

An international airport in Asia handles 42.3 million passengers and 2.1 billion kilograms of freight annually, making it one of the top ten busiest airports by international passenger traffic. Due to the pressing requirements to prevent terror attacks and control access of people and vehicles to restricted zones within the airport, **Gorilla's Intelligent Video Analytics Platform** was deployed to provide facial and vehicle recognition from CCTV video streams.

The solution enables the following functionality:

- Monitor suspicious activities and track blacklisted suspects using facial recognition
- Manage outsourced vendors using facial recognition-based attendance systems
- Search late boarding travelers
- Regulate vehicles entering restricted areas using license plate recognition

2. National Police Agency

A national police agency in Asia is responsible for the maintenance of public order and enforcement of the country's laws, and currently has over 230,000 employees. They required a system to allow them to use citywide and countrywide video surveillance installations to intelligently and automatically monitor people and vehicle activity and to locate and track suspicious targets.

Gorilla's Intelligent Video Analytics Platform was deployed to provide better management of local security and public safety, and enable fast action in volatile situations.

The solution enables the following functionality:

- Track, monitor and pinpoint people and vehicles across the country
- Identify people and vehicles through facial recognition and license plate recognition respectively from live video streams and recorded video
- Notify responsible departments when people and vehicles on a watch-list are identified

REFERENCES

[1]***The Guardian*** Cities in Numbers: How Patterns of Urban Growth Change the World, November 23rd 2015

[2]***United Nations*** 68% of the World Population Projected to Live in Urban Areas by 2050, 16 May 2018

[3]***NVIDIA*** NVIDIA Paves Path to AI Cities with Metropolis Edge-to-Cloud Platform for Video Analytics, May 8 2017

[4]***IHS MARKIT*** *AI in Video Analytics: Improving Safety, Security, and Operations*, Report by Oliver Philippou 20185

FOR FURTHER INFORMATION, PLEASE CONTACT:

GIGABYTE™

http://b2b.gigabyte.com

https://www.gigabyte.com/Contact

Email: server.grp@gigabyte.com

Gorilla

http://www.gorilla-technology.com