ISS SecurOS® AI Performance and Validation Report on Supermicro Servers with Intel® Processor

Report

April 2024

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Contents

Tables

Revision History

Date	Revision	Description
April 2024	1.0	Initial release.

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1.0 Overview

This document provides an overview and results for validation of SecurOS® AI Video Analytics Modules running on an enterprise server solution (Dell Technologies PowerEdge* systems) installed with a production version of the SecurOS® Platform optimized for the Intel® Distribution of OpenVINO™ Toolkit.

ISS Video Analytics algorithms (VA algorithm) can be performed either on CPU, or on a special High-Density Deep Learning (HDDL) acceleration card. The focus of this report will be running the VA algorithm on the CPU.

Configuration for multi-stream in-process analytics (no video stored) includes a pipeline process of video decode, video analytics via AI model with video analytics metadata creation, and injection of metadata into reporting and visualization platform.

1.1 Objective

The objective of the validation process is to:

i. Validate and Size the system configuration for concurrent multi-stream video analytics.
ii. Ensure that Thermal and Cooling setting provides long hours sustainable performance.
iii. Validate that VA algorithms' payload is evenly distributed across all compute units:
    - For CPU VA acceleration – the balancing load across all CPU cores is validated
iv. Confirm that maximum video analytics channel density is achieved at 90-95% of maximum compute capacity:
    - For CPU Video analytics, VA channels are added till CPU reaches 90% load (sizing recommendations are done at max of 70% CPU usage)
v. Confirm that overall software/hardware solution is steady and operates without fail(s) for at least 24 hours.
vi. Measure and log key system running parameters:
    - Overall system CPU load: average and standard deviation. Sampling every 1-sec cadence
    - System inlet and outlet air temperature (iDRAC)
    - System fan RPMs and cooling configuration (iDRAC)
    - System average power consumption (iDRAC)
    - Video analytic inference performance in frames per second: Average and deviation

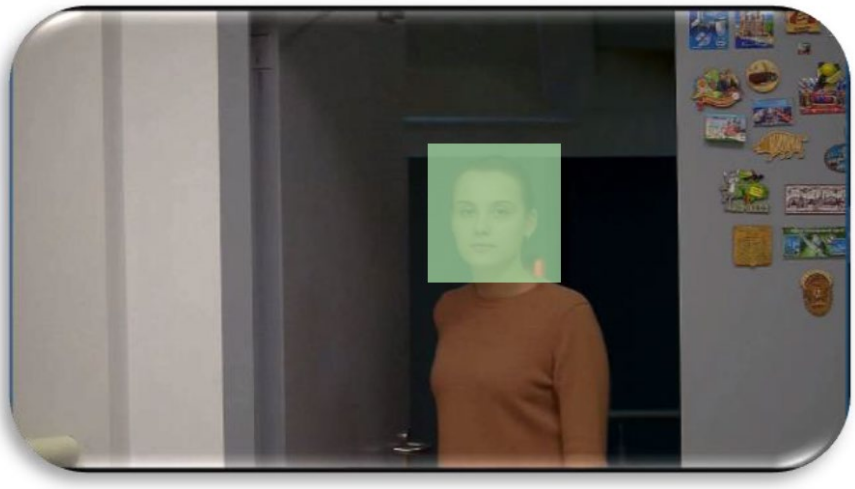
1.2 ISS SecurOS® AI Modules

From license plate recognition, facial recognition for access control, to cameras integrated with dynamic street lighting for pedestrian safety, SecurOS® offers a wide range of intelligent video solutions to address a diverse array security and safety challenges. The following SecurOS® AI Modules were tested in this report:

- SecurOS® Auto (High speed)

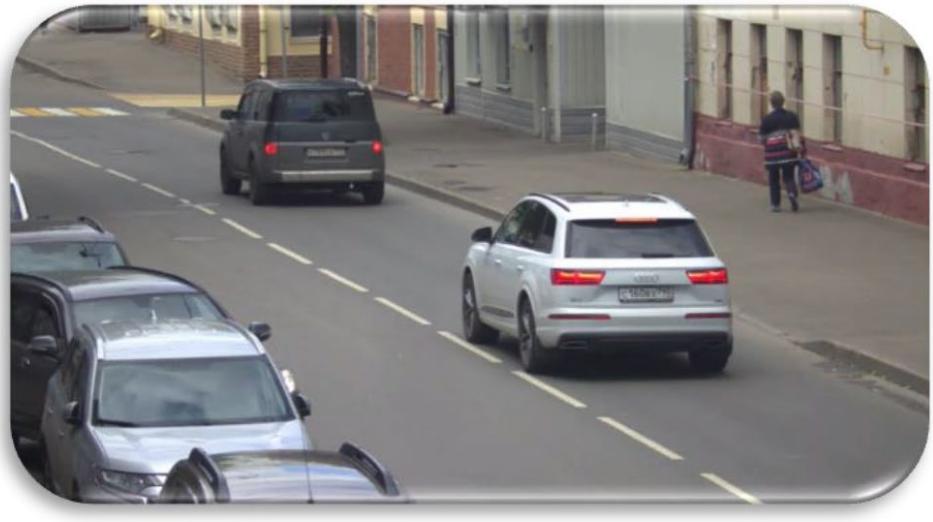
- SecurOS® Auto (Low speed)

- SecurOS® FaceX (Checkpoint)

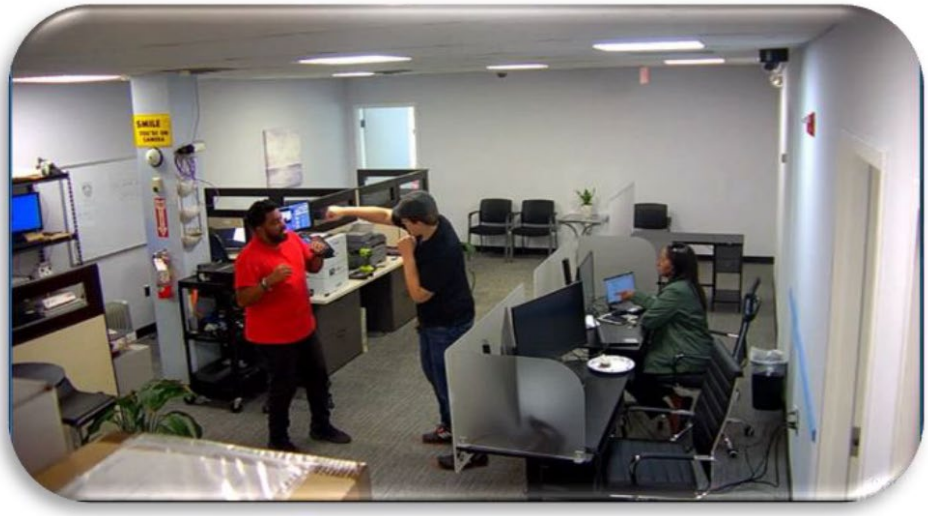


- SecurOS® FaceX (Crowd)

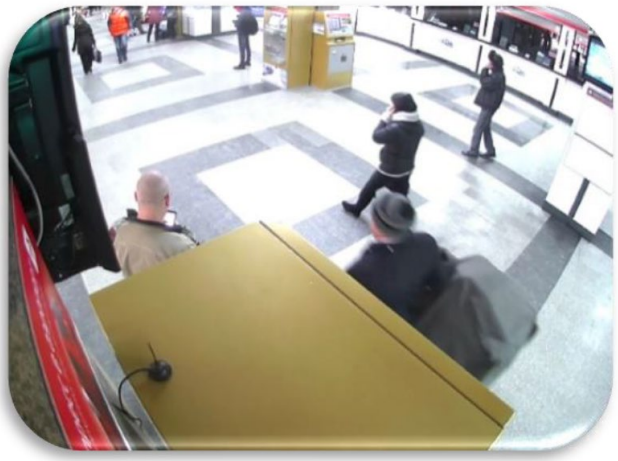
- SecurOS® Tracking Kit



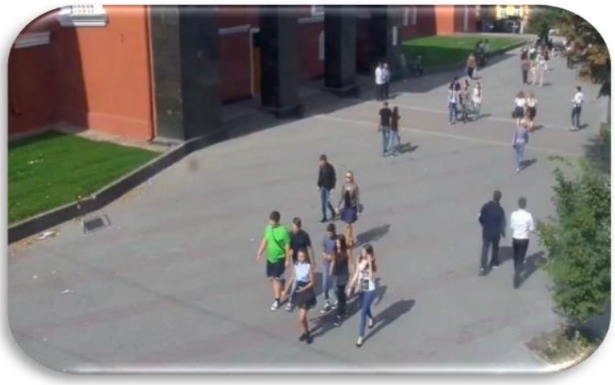
- SecurOS® NN Fighting



- SecurOS® NN Loitering



- SecurOS® NN Occupancy Counting



- SecurOS® NN Man Down

1.3 Supermicro Servers

Supermicro servers tested in this report:

- SuperServer E300
- SuperServer E302
- SuperServer E403
- SuperServer 211E

1.4 Intel® Distribution of OpenVINO™ Toolkit Overview

OpenVINO™ is an open-source toolkit for optimizing and deploying AI inference.

1. Boost deep learning performance in computer vision, automatic speech recognition, natural language processing and other common tasks.
2. Use models trained with popular frameworks like TensorFlow*, PyTorch* and more.
3. Reduce resource demands and efficiently deploy on a range of Intel® platforms from edge to cloud.

Click here to learn more about the Intel® Distribution of OpenVINO™ Toolkit.

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2.0 System Configurations

Table 1. Supermicro SuperServer E300 - System Configuration

Components	Version
Hardware and OS	
OS	Windows 11 Enterprise 21H2
CPU	Intel® Core™ i3-12300HL Processor @2.0GHz (8 Cores, 12 Threads)
RAM	2 x 16GB 4800MHz
GPU	Intel® UHD Graphics 730 (Integrated)
Network	1 x 1GBASE-T
Drives	1 SATA SSD x 480GB ; 1 SSD x 1TB
SecurOS Software	
SecurOS® version	11.6 R1
TK3 NN version	2.2.146.6
Auto NN version	2.2.146.6
Other Software	
OpenVINO™	OpenVINO™ Toolkit v.2022.3

Table 2. Supermicro SuperServer E302 - System Configuration

Components	Version
Hardware and OS	
OS	Windows Server 2019 Standard
CPU	Intel® Xeon® D-1736NT Processor @2.7GHz (8 Cores, 16 Threads)
RAM	4 x 32GB DDR4 2666MHz
GPU	none
Network	2 x 1GBASE-T
Drives	480GB

Components	Version
SecurOS Software	
SecurOS® version	11.6 R1
TK3 NN version	2.2.146.6
Auto NN version	2.2.146.6
Other Software	
OpenVINO™	OpenVINO™ Toolkit v.2022.3

Table 3. Supermicro SuperServer E403 - System Configuration

Components	Version
Hardware and OS	
OS	Windows Server 2019 Standard
CPU	Intel® Xeon® Gold 6338N Processor @2.2GHz (32 Cores, 64 Threads)
RAM	8 x 32GB DDR4 2666MHz
GPU	none
Network	2 x 1GBASE-T
Drives	1HDD x 480GB ; 1HDD x 960GB
SECUROS Software	
SecurOS® version	11.6 R1
TK3 NN version	2.2.146.6
Auto NN version	2.2.146.6
Other Software	
OpenVINO™	OpenVINO™ Toolkit v.2022.3

Table 4. Supermicro SuperServer 211E - System Configuration

Components	Version
Hardware and OS	
OS	Windows Server 2019 Standard
CPU	Intel® Xeon® Gold 6414U Processor @2.0GHz (32 Cores, 64 Threads)
RAM	8 x 64GB DDR4 4800MHz
GPU	2x Intel® Data Center GPU Flex 140 (5120MB GDDR6 SDRAM) (Single Flex 140 card)
Network	2 x 1GBASE-T
Drives	1HDD x 480GB ; 1HDD x 960GB
SecurOS Software	
SecurOS® version	11.6 R1
TK3 NN version	2.2.146.6
Auto NN version	2.2.146.6
Other Software	
OpenVINO™	OpenVINO™ Toolkit v.2022.3

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3.0 Profiling

3.1 Validation Steps

1. Deploy and Configure Dell Technologies* PowerEdge* Server.
2. Install Windows Operating System and SecurOS® Analytics Platform with Testing Criteria.
3. Configure ISS RTSP Video Emulator with appropriate virtual video streams for required load emulation.
4. Set up the SecurOS® video analytics to process the virtual video streams.
5. Run Windows and 3rd party system profiler tools to record hardware usage and other metrics over a given period of time.
    a. Internal SecurOS® Profiler tool identifies when there is degradation in performance of the Analytics Modules (skipped frames, overflows, long event queues, etc..) due to reaching high system loads.
6. Process results to generate tabulated data using multiple readings.
7. Analyze results and report.

3.2 Checklist for Results Validation

1. SecurOS is utilizing the maximum amount of CPU without compromising the system accuracy.
    a. ISS recommended max CPU usage does not exceed 70%.
2. Checking if there are any errors generated by SecurOS® Profiler tool.
3. Check if Core Temperature and CPU Package Temperature do not exceed 85°C.
4. Check if there is no Core Thermal Throttling.
5. CPU usage and Memory consumption values are consistent during the test.
6. Archive is being recorded constantly during the test.

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4.0 Performance Test Results

4.1 Supermicro E300

SecurOS® Module	Camera Resolution	Camera FPS	Cameras	Cores / 1 Cam
Auto –Low Speed (US)	1280x720	30	2	4.00
Auto –High Speed (US)	1920x1080	25	1	8.00
FaceX–Checkpoint	1920x1080	25	6	1.33
FaceX–Crowd	1920x1080	25	4	2.00
Tracking Kit	1920x1080	25	9	0.88
NN Loitering	640x480	12	1	8.00
NN Occupancy	640x480	12	2	4.00
NN Man Down	640x480	6	10	0.80
NN Fighting	640x480	10	14	0.57

4.2 Supermicro E302

SecurOS® Module	Camera Resolution	Camera FPS	Cameras	Cores / 1 Cam
Auto –Low Speed (US)	1280x720	30	4	2.00
Auto –High Speed (US)	1920x1080	25	3	2.66
FaceX–Checkpoint	1920x1080	25	10	0.80
FaceX–Crowd	1920x1080	25	6	1.33
Tracking Kit	1920x1080	25	14	0.57
NN Loitering	640x480	12	5	1.60
NN Occupancy	640x480	12	5	1.60
NN Man Down	640x480	6	16	0.50
NN Fighting	640x480	10	19	0.42

4.3 Supermicro E403

SecurOS® Module	Camera Resolution	Camera FPS	Cameras	Cores / 1 Cam
Auto –Low Speed (US)	1280x720	30	16	2.00
Auto –High Speed (US)	1920x1080	25	11	2.90
FaceX–Checkpoint	1920x1080	25	27	1.18
FaceX–Crowd	1920x1080	25	21	1.52
Tracking Kit	1920x1080	25	50	0.64
NN Loitering	640x480	12	10	3.20
NN Occupancy	640x480	12	23	1.39
NN Man Down	640x480	6	36	0.88
NN Fighting	640x480	10	76	0.42

4.4 Supermicro 211E

SecurOS® Module	Camera Resolution	Camera FPS	Cameras	Cores / 1 Cam
Auto –Low Speed (US)	1280x720	30	24	1.33
Auto –High Speed (US)	1920x1080	25	10	3.20
FaceX–Checkpoint	1920x1080	25	54	0.59
FaceX–Crowd	1920x1080	25	34	0.94
Tracking Kit	1920x1080	25	46	0.69
NN Loitering	640x480	12	10	3.20
NN Occupancy	640x480	12	105	0.30
NN Man Down	640x480	6	41	0.78
NN Fighting	640x480	10	82	0.39

4.5 Analysis

i. All tests met, and in some cases, exceeded performance expectations.

ii. The 4th Gen Intel® Xeon® Gold processors showed on average a 25% performance increase compared to the 2nd Gen Intel® Xeon® processors that were used by SecurOS.

iii. The Intel® Data Center GPU Flex 140 provided a good performance boost to the AI modules.

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5.0 Conclusion

Based on the analysis in this report, we can define the specifications required per stream/camera to be deployed using the Supermicro systems specified in this document. The results are adequate to support the requirements typically required for production deployments.

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