

凌華科技 高速AI自動光學檢驗方案



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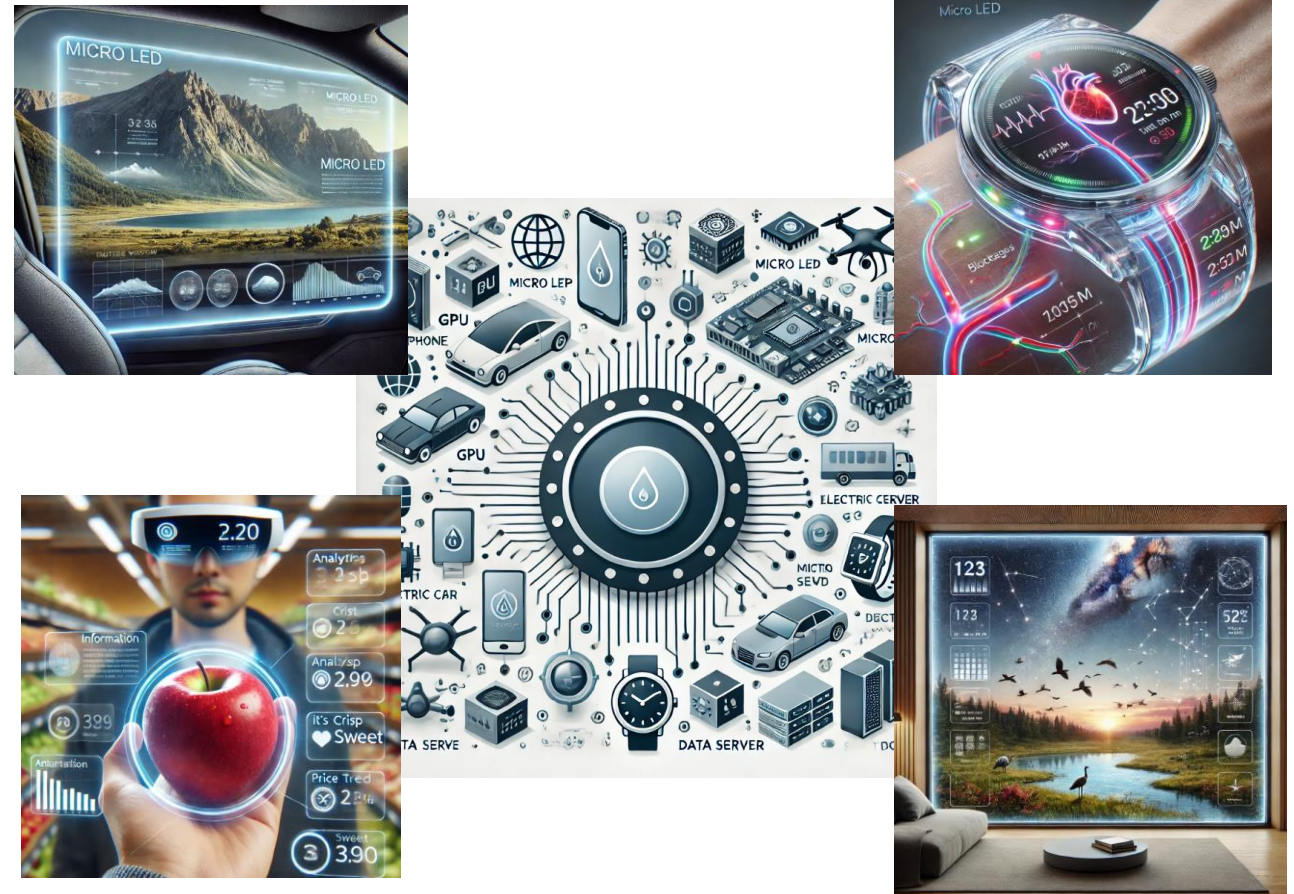
半導體與AOI+AI的發展趨勢

半導體技術深深影響著我們的生活，隨著製程技術的不斷進步

- 元件尺寸越來越小
- 數量卻越來越多

導致檢測流程更加複雜和耗時。

聚焦於Micro LED應用案例，探討其檢測需求和我們的解決方案。



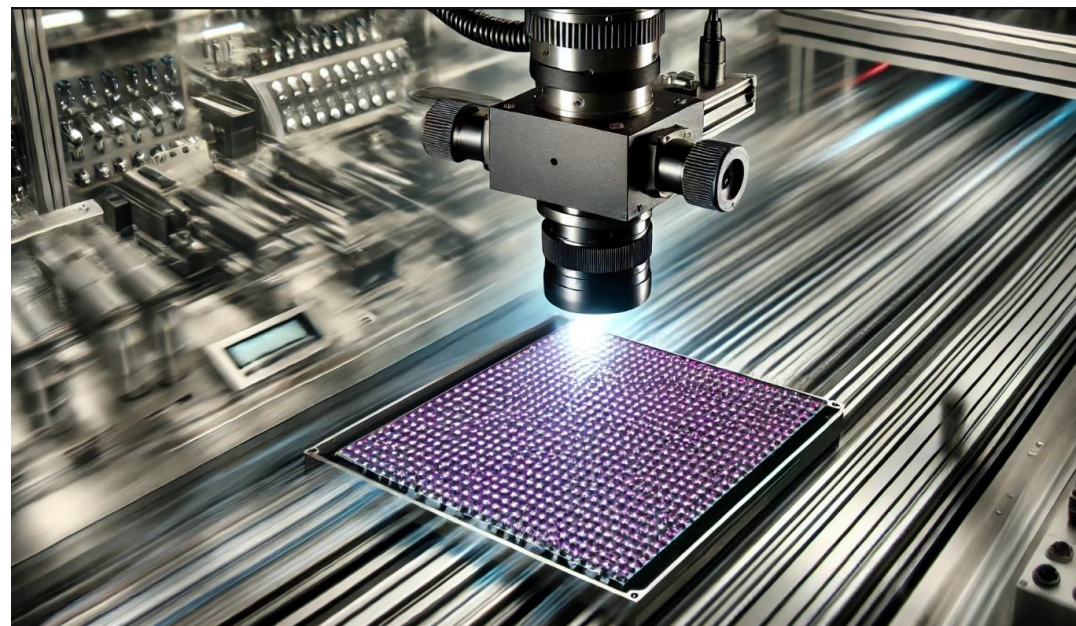
8K顯示器，有多少顆Micro LED要被檢出？

- **Micro LED Size** :
Micro LED的尺寸通常被定義為 $<100\mu\text{m}$ ，主流尺寸在 $30\mu\text{m}$ 到 $85\mu\text{m}$ 之間，未來有潛力進一步縮小到10微米以下
- **Quantity of Micro LEDs** :
以8K顯示器為例， $7680*4320*3$ (RGB) 約需安裝**1億個LED**，這使得巨量轉移過程中的精確度和效率成為一大挑戰。
- **Detection rate**
商用化程度Micro LED巨量轉移良率以99.5%計算，一台8K顯示器上的不合格晶片將高達497,664顆。



Micro LED機台速度300 ~ 200mm/s ，相機要拍多快？

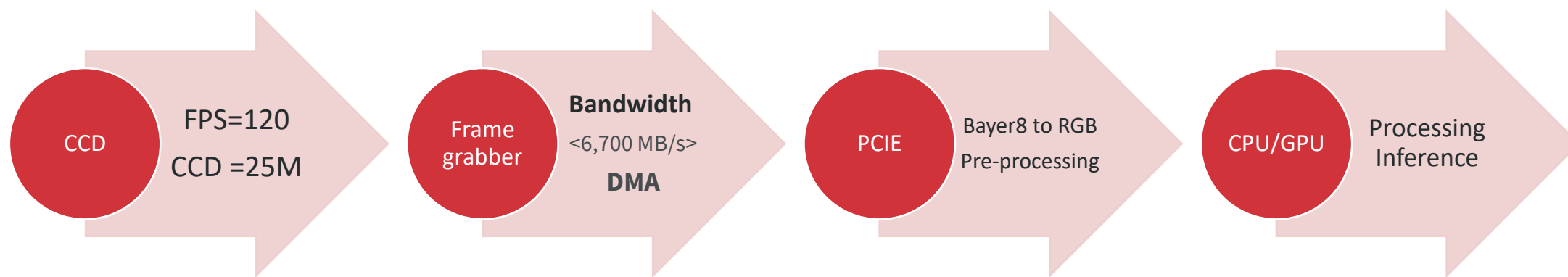
- **FPS：**
工業相機取樣率為100 ~ 150HZ.
- **解析度：**
Micro LED的尺寸介於30 ~ 85um，業界相機主流使用大於25MB相機解析度為5120*5120。
- **相機的傳輸介面：**
傳輸率=25M×8bits×150 FPS = 30Gbps (3750MB/s)
(可連續觀看約21分鐘在1080P畫質)
(可連續觀看約2.5分鐘在4K畫質)



Micro LED檢測所遭遇困難

.....

時間?



6 ~ 10ms 內完成上述工作

DMA確實減少CPU loading，殊不知GPU算力不足才是困境



工業相機傳輸頻寬逐漸提升
縱使導入DMA(Direct Memory Access)
減少的CPU負載，但其實造成GPU的
loading越來越重。

導致了Nvidia股票高漲。

GPU 運用於各演算法 效能真的滿足10ms需求?

影像處理時間：

1. 影像解碼：Bayer8 to RGB

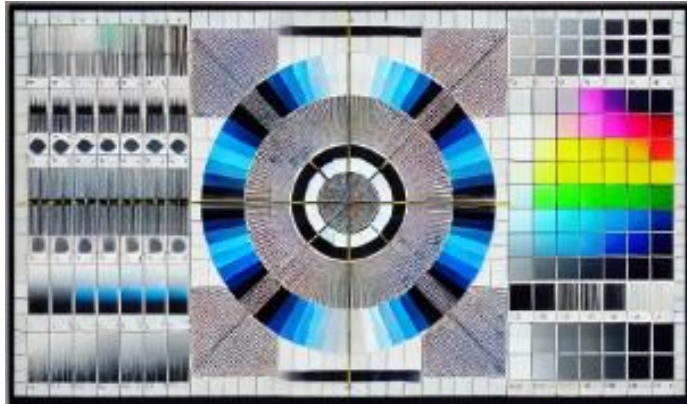
GPU型號	解析度	轉換速度 (FPS)	處理時間
RTX 4090	1080p	1000+	0.1 ms
RTX 4090	4K	300	3.33 ms

AI處理時間：

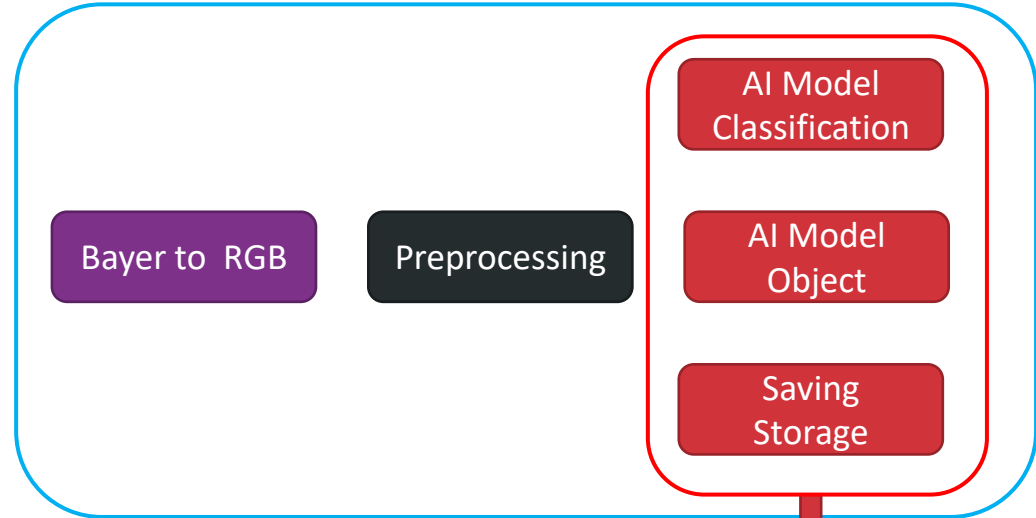
1. Classification
2. Object Detection
3. Segmentation

Task	Model	Image Size	Time Per Image (ms)
Image Classification	ResNet-50	224x224	0.5 - 0.6 ms
Object Detection	YOLOv5	640x640	1 - 2 ms
Image Segmentation	DeepLabV3	512x512	13 ~ 17 ms

需幾種處理方能找出Micro LED瑕疵？



瑕疵處理流程



事實證明10ms也無法做到此需求

Working time >25ms

ADLINK Solution for Real-Case

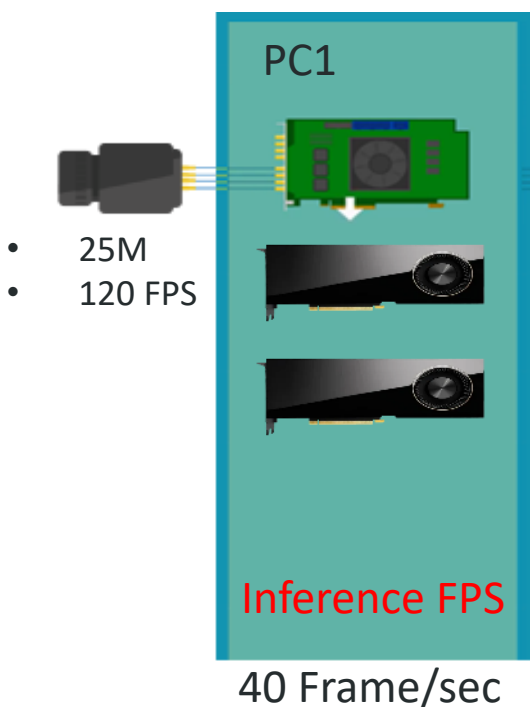
尚未導入

1. CCD spec is 25M.
2. FPS is 120.
3. Inference FPS less 45 frame.

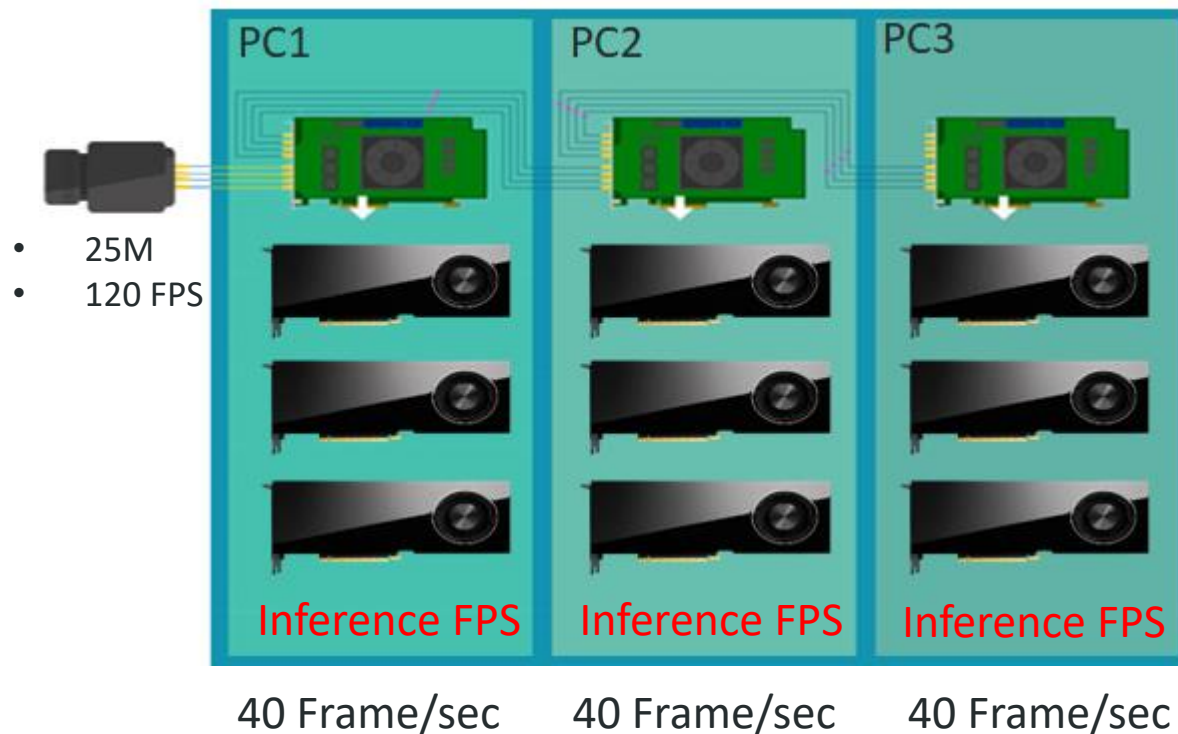
Adlink 方案導入後

1. CCD spec is 25M.
2. FPS is 120.
3. Total Inference FPS = 120 (40+40+40)

原架構



ADLINK 解決方案

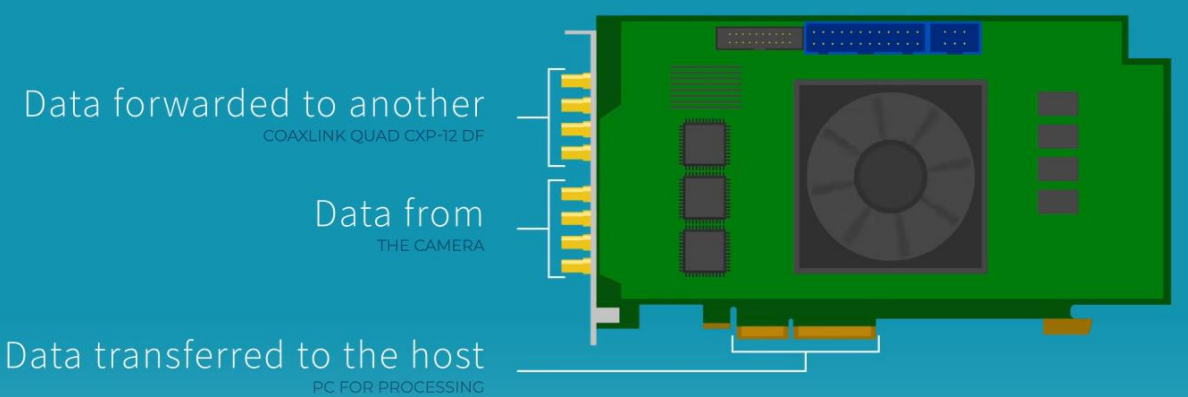


ADLINK offering 1: Frame grabber for Data Forwarding

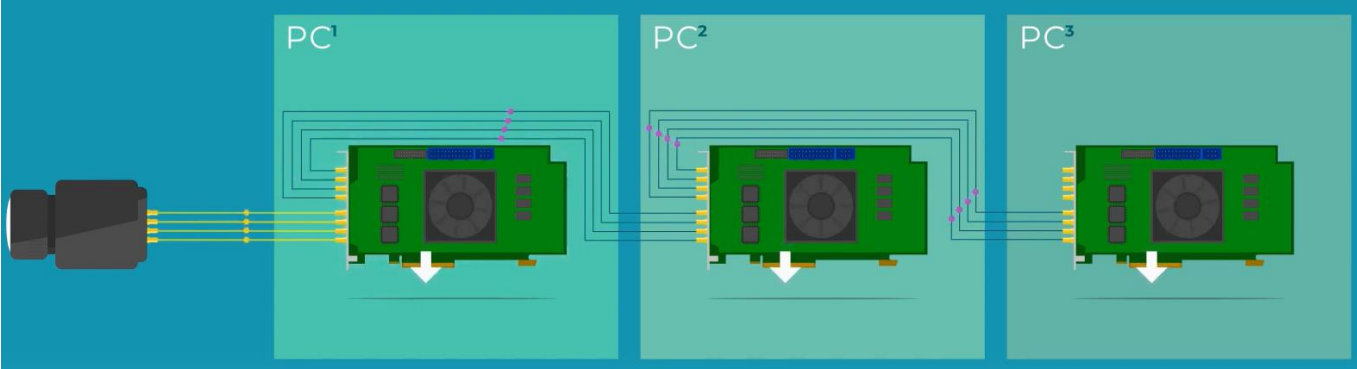
Coaxlink Quad CXP12 DF



How does it work ?



This allows for several PCs, up to 10



透過影像分流，增加總架構Computing power

ADLINK offering 2: Frame grabber for Multi-cam

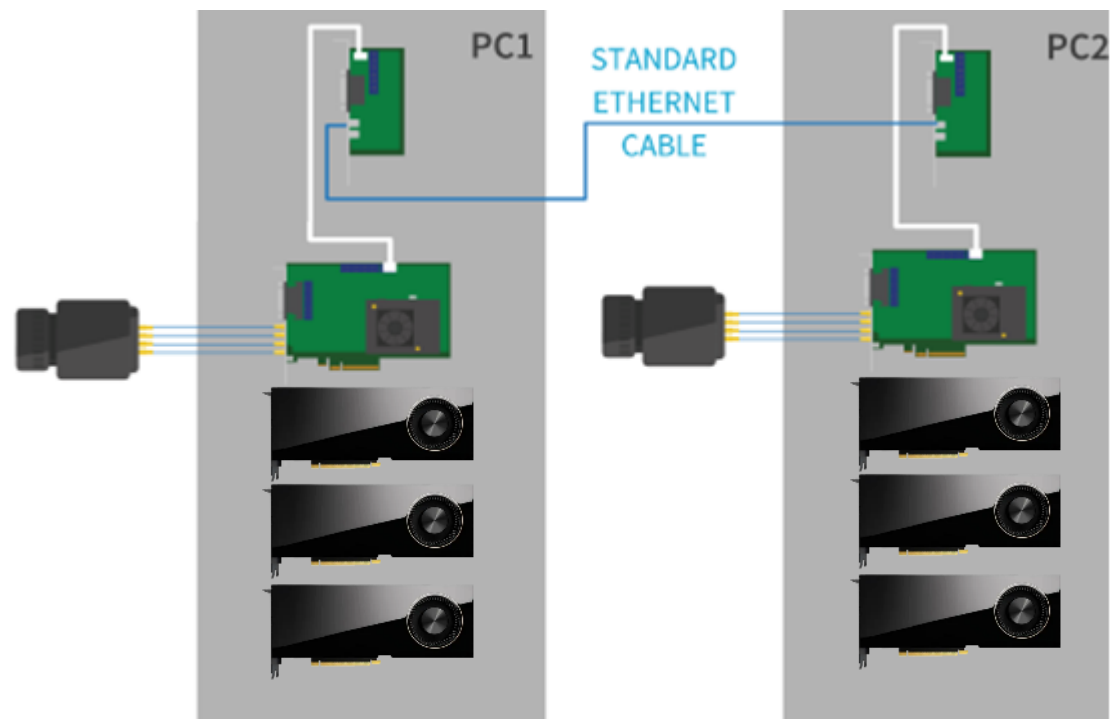
C2C Link

能實現同一PC或遠程PC中一個或多個Coaxlink卡相連的多台相機的同步。

Real Case :
Multi-camera同時拍照。



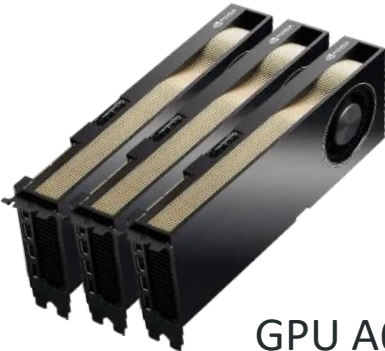
實現Multi-camera 示意圖



ADLINK offering 3: AI SERVER



AXE-7400SR



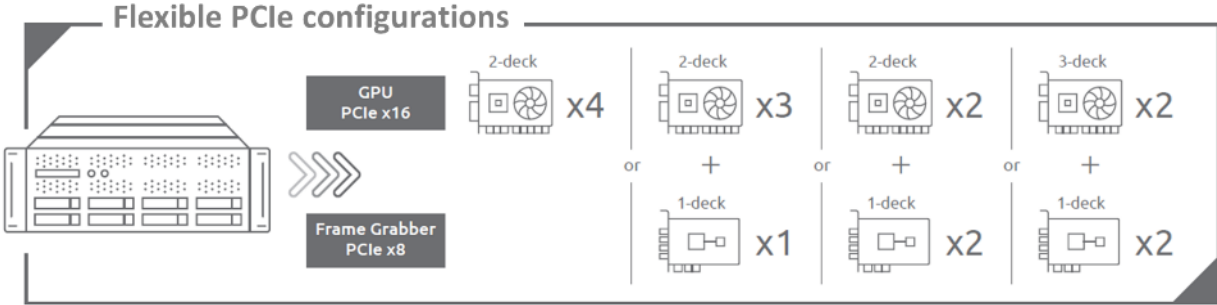
GPU A6000



CXP-12 DF

- **High Capacity:** Support up to 4x Full-size dual-slot GPU cards
- **Full Bandwidth:** PCIe Gen4 x16 speed per GPU, even with multiple GPUs.

	PC: Intel Core i9-13900K (13th Gen)	Server: Intel Xeon Platinum 8490H (4th Gen)	
PCie Lanes	16X PCIe 5.0 lanes (CPU) + chipset lanes	80X PCIe 5.0 lanes per CPU	More GPU and add-on cards
Memory	DDR5-5600, DDR4-3200; Dual-channel	ECC RDIMM DDR5-4800, DDR4-3200; Octa-channel	Data precise/reliable
Max Memory	128GB	6TB per socket (with Optane)	High performance
Cores/Threads	24 Cores (8P + 16E) 32 Threads	60 Cores 120 Threads	Multi-tasks
Cache	36MB Intel Smart Cache	105MB L3 Cache	HPC/AI



全方位AI邊緣運算平台 驅動高效AOI

AI VISION

Edge AI Development Suite

EdgeGO

10 GIG-E VISION GIG-E VISION USB CAMERA LINK

影像擷取卡

NEON AI智慧相機

DLAP 邊緣AI運算平台

MEC AI 邊緣伺服器

Thank You!

Edge AI Vision
型錄下載



Edge AI Vision
解決方案介紹



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THANK YOU

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