



AIoT for Smart Factory

Q4, 2019

AIOT



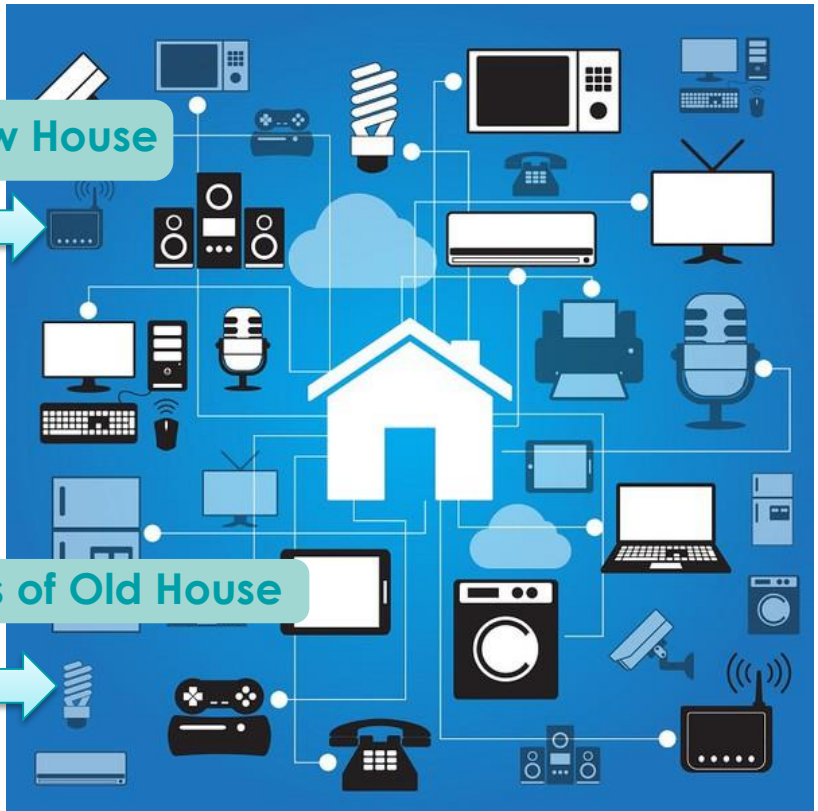
INTERNET OF THINGS



IoT – Smart Home



Barrier-free in New House



Barriers in Legacies of Old House

IoT - Smart Factory



Barrier-free in New Plant Planning

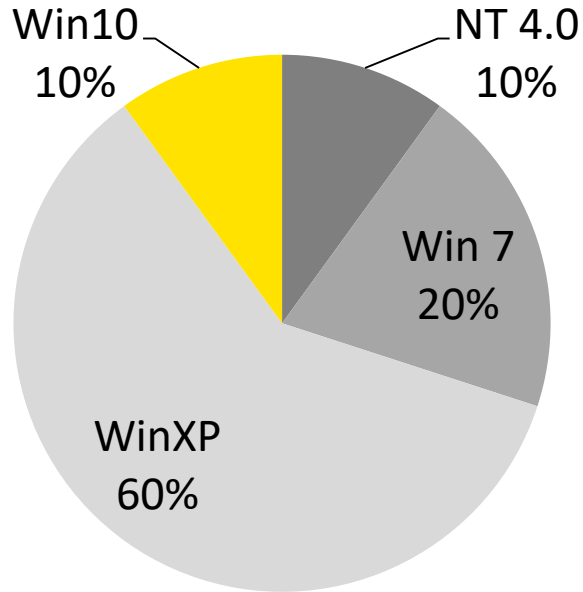


Barriers in Connecting Legacies in Old Plant



Why upgrading IPC now?

- Most of factories have been faced with difficulty in **legacy maintenance**
- Issues regarding hardware upgrading occur to customers as the **old hardware turns EOL:**
- **ISA & PCI I/O card** firmware/driver should be modified to support **Windows 10**
- The **manufacturing process** should be adjusted with new devices

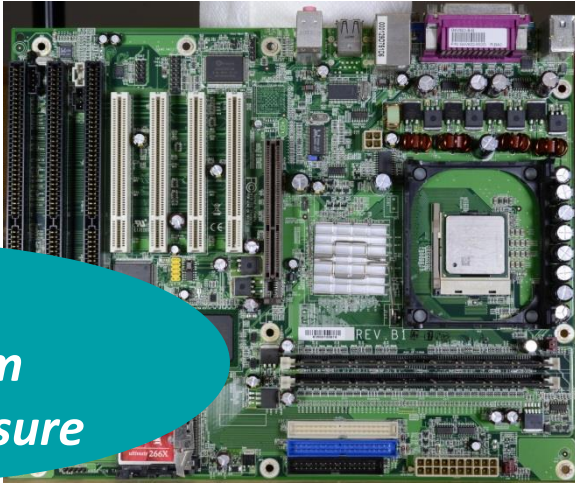


Challenges

- **Huge investment** in equipment
- **Machine aging**, material turning EOL, and services suspended by suppliers
- Legacy operating system (Windows NT, Windows 98, **Windows XP**)
- **Traditional I / O** (ISA, PCI, AGP ..)
- Difficulty in predicting **equipment refresh**

IPC Refresh in Practice

DFI G4V620-B
Industrial Mother board



*Win NT
short-term
countermeasure*

Intel P41 Core Produced in 2008

Goals

- Postpone production suspension, reduce the cost of **equipment upgrade**
- Maximal **cost saving** on R&D
- **Extend life** cycle support
- Improve **performance**
- Reliability and **efficiency**
- Better scalability and **flexibility**

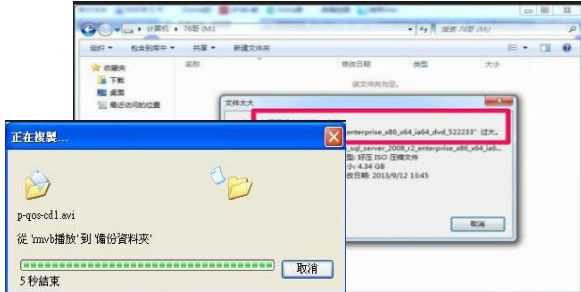
How to Update & Upgrade from Old to New

Pass

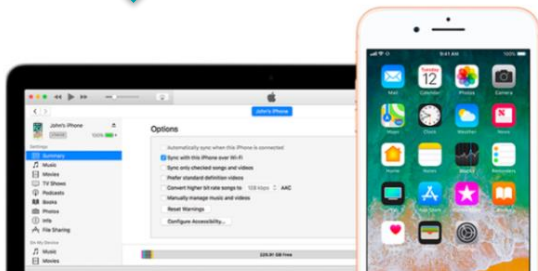


Partial Backup

- Photo
- Video
- Message
- Directory
- ...



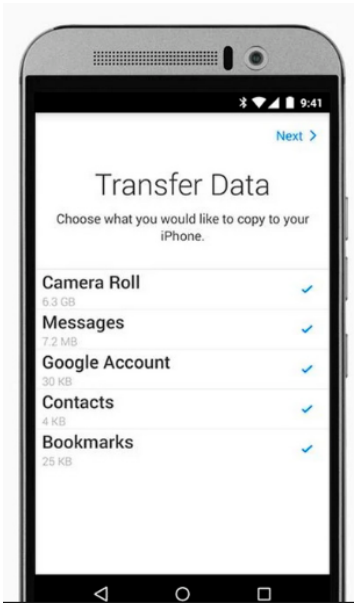
Output



Partial Transfer

How to Update & Upgrade from Old to New

NOW



Using the same idea in upgrading legacy IPCs

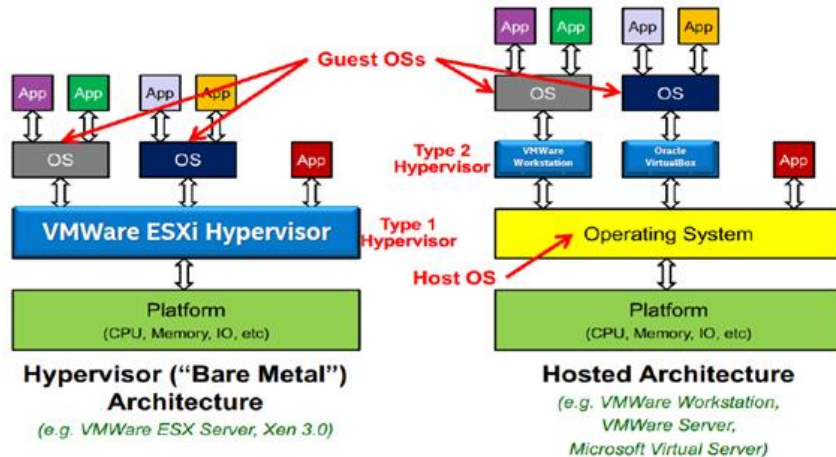
INTEL IPC REFRESH TECHNOLOGY



Why Need Intel IPC Refresh?

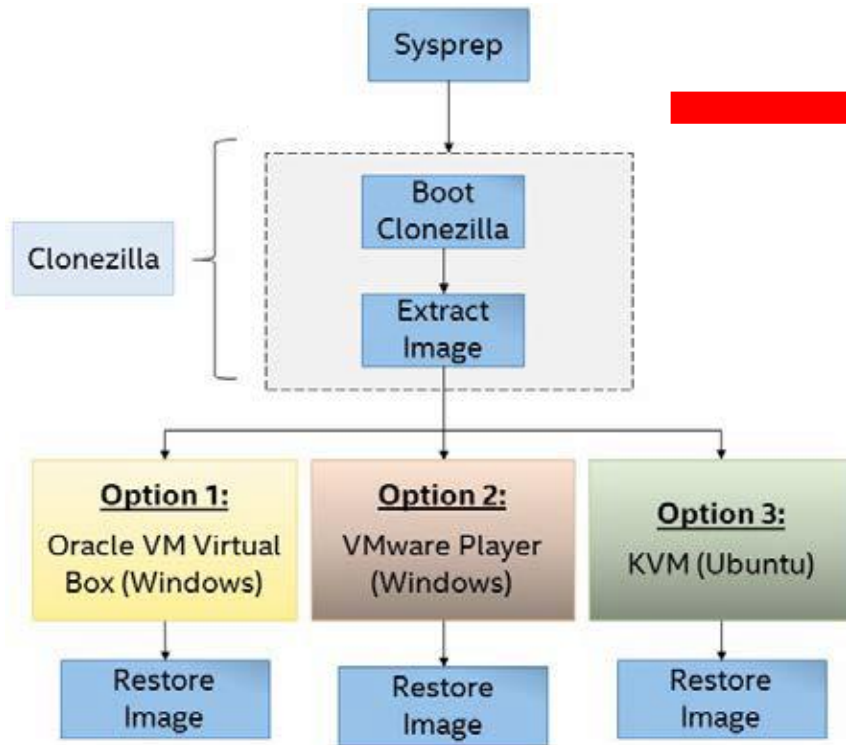
VIRTUALIZATION ARCHITECTURE

Bare Metal vs Hosted Architecture



- **IPC REFRESH** is connecting the device which cannot be connected and reducing operation cost
- The key to solve **aging IPC**, reducing the risk of malfunction production line

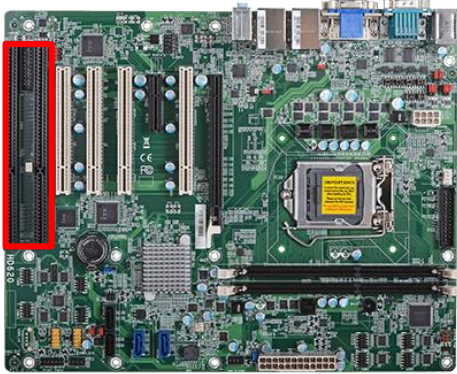
IPC Refresh Technical Process



1. Generalize PC via Windows Sysprep tool.
2. Create bootable Clonezilla USB.
3. Extract legacy image to USB device.

DFI Industrial Mother Board w/ Legacy support

ISA Solution



HD620

- Intel Platform
 - 4th Gen. with H81 Chipset
- Dual Display
 - 1 VGA, 1 DVI-I
- Multiple Expansion
 - 1 PCIe x16, 1 PCIe x4, 4 PCI, **2 ISA**
- Rich I/O
 - 2 Intel GbE, 10 USB, 10 COM

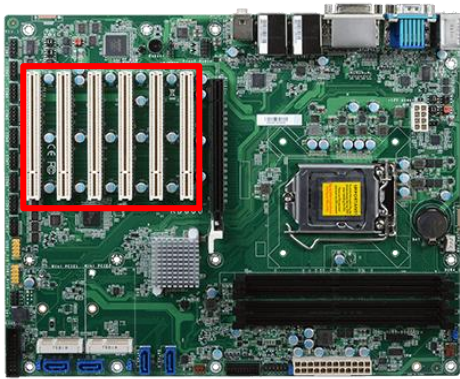


CS620

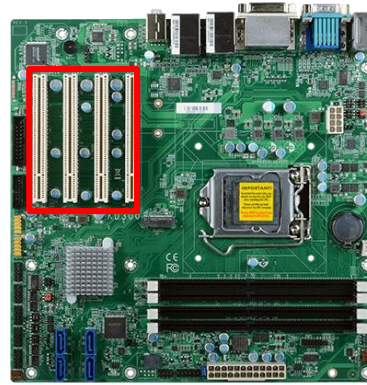
- Intel Platform
 - 8/9th Gen. with H310 Chipset
- Triple Display
 - 1 VGA, 1 DVI-I, 1DP++
- Multiple Expansion
 - 1 PCIe x16, 1 PCIe x4, 4 PCI, **2 ISA**
- Rich I/O
 - 2 Intel GbE, 12 USB, 10 COM

DFI Industrial Mother Board w/ Legacy support

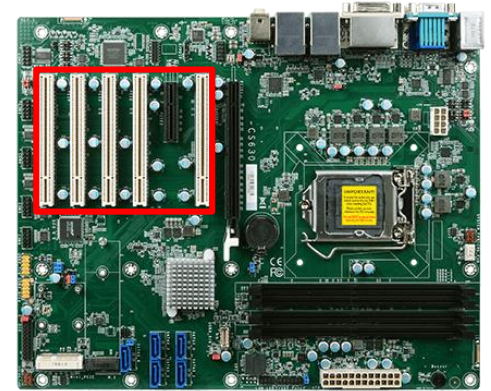
PCI Solution



KD600



KD300



CS630

Intel Platform

- 6/7th Gen, with H110/Q170

Triple Display

- 1 VGA, 1 DVI-D, DP++

Multiple Expansion

- 1 PCIe x16, 6 PCI

Rich I/O

- 2 Intel GbE, 12 USB, 10 COM

Intel Platform

- 6/7th Gen, with H110/Q170

Triple Display

- 1 VGA, 1 DVI-D, DP++

Multiple Expansion

- 4 PCI

Rich I/O

- 2 Intel GbE, 12 USB, 6 COM

Intel Platform

- 8/9th Gen, with H310/Q370

Triple Display

- 1 VGA, 1 DVI-D, DP++

Multiple Expansion

- 1 PCIe x16, 1 PCIe x4, 5 PCI

Rich I/O

- 2 Intel GbE, 12 USB, 6 COM

DFI Embedded System w/ Legacy support

PCI Solution



EC550-HD/SD/CS



EC540-HD/SD/CS



RM641-SD

- Intel Platform
 - 6/7th Gen, with H110/Q170 Chipset,
- Triple Display
 - 1 VGA, 1 DVI-D, 1 DP
- Multiple Expansion
 - 1 PCIe + 4 PCI or 5 PCI
- Rich I/O
 - 2 Intel GbE, 10 USB, 2 COM, 8bit DIO

- Intel Platform
 - 6/7th Gen, with H110/Q170 Chipset,
- Triple Display
 - 1 VGA, 1 DVI-D, 1 DP
- Multiple Expansion
 - 1 PCIe + 3 PCI
- Rich I/O
 - 2 Intel GbE, 6 USB, 6 COM, 8bit DIO

- Intel Platform
 - 6th Gen Intel® Core™
- Triple Display
 - 1 VGA, 1 DVI-D, 1 HDMI
- Multiple Expansion
 - 2 PCIe x16, 2 PCIe x4, 3 PCI
- Rich I/O
 - 2 Intel GbE, 6 USB, 1 COM

INTEL ACRN™ HYPERVISOR



Silicon Technologies

Intel® VT - x

- CPU Virtualization
- Memory Virtualization

Intel® VT - d

- I/O Virtualization

Intel® VT- c

- Virtualization of Network Devices

Intel® Graphics Virtualization Technology (GVT)

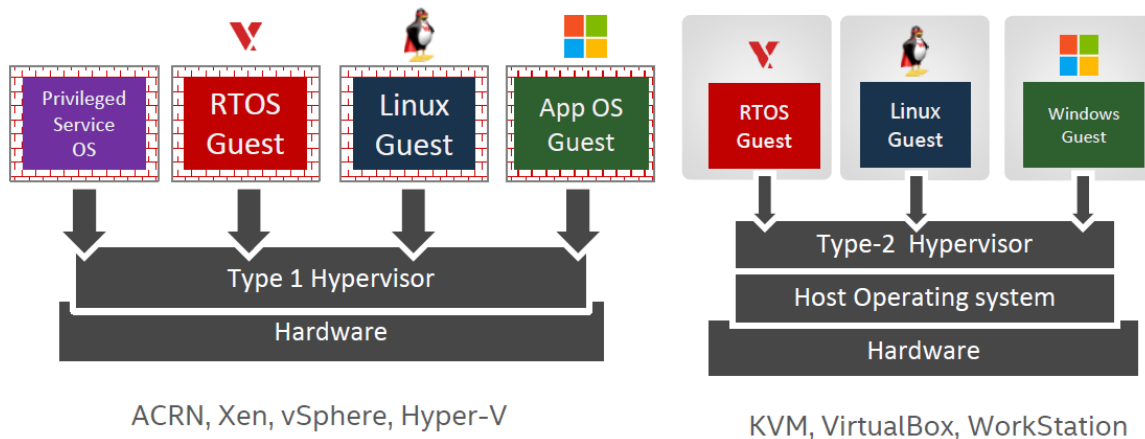
→ Graphics SR-IOV in future products

For more information:

<https://www.intel.com/content/www/us/en/virtualization/virtualization-technology/intel-virtualization-technology.html?wapkw=virtualization>

SR-IOV = Single Root Input output Virtualization

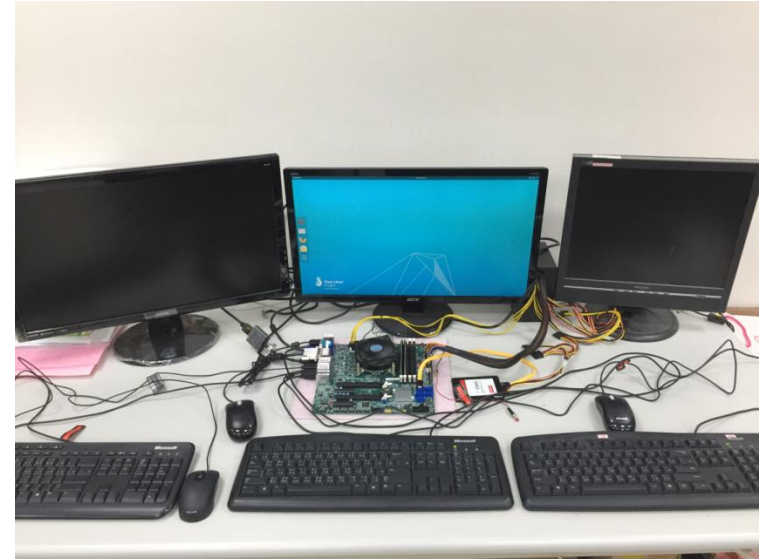
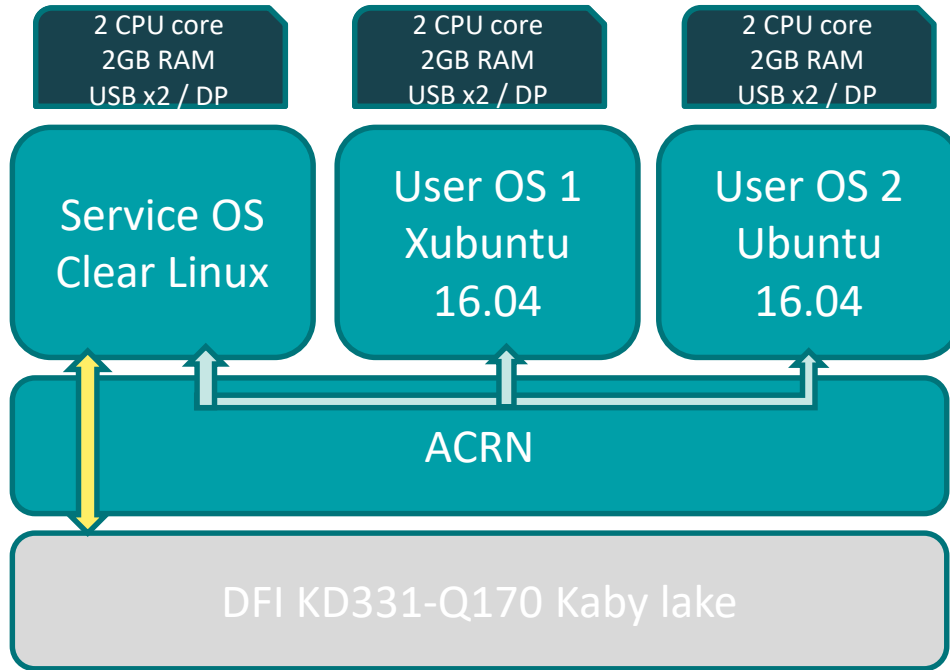
COMPARISON OF VIRTUAL MACHINES



Single Hardware with Dedicated I/Os



ACRN hypervisor Demo



DFI KD331

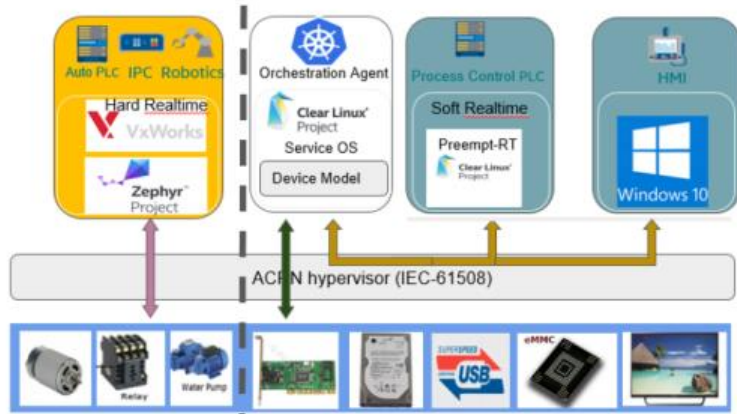
CPU: Intel i7-7700

M/B: DFI KD331-Q170

RAM: DDR4 4GB x2

HDD: 64GB SATA SSD

ISD (ROBOT ARM + HMI)



Requirements

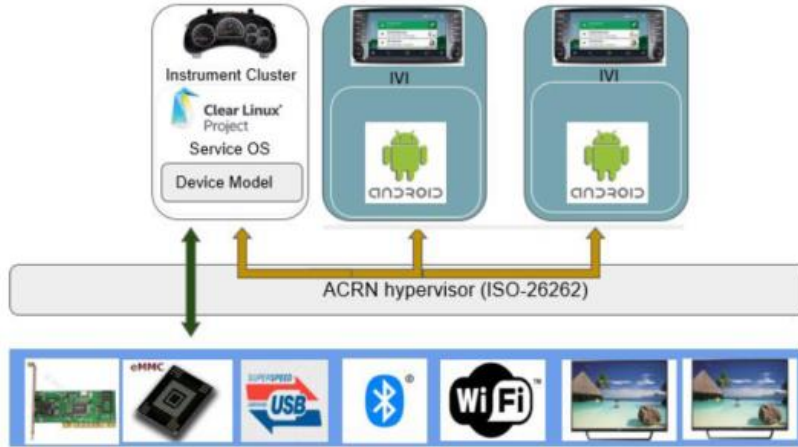
- RTOS support
- Windows as guest OS
- Redundancy backup
- FuSa

Workloads

1. Robot ARM control (mission critical)
2. AOI (OpenVINO)
3. HMI



TSD (DASHBOARD + IVI)



Requirements

- RTOS/Android OS as Guest OS
- I/O driver support (UART/CAN)
- GVT-g
- FuSa

Workloads

1. Dashboard (mission critical)
2. IVI – front seat
3. IVI – rear seat



RSD (SURVEILLANCE + SIGNAGE + POS)



Workloads

1. Surveillance (OpenVINO+VAD)
2. Digital Signage (M.A.R.S)
3. POS

Requirements

- GVT-g
- Windows as Guest OS



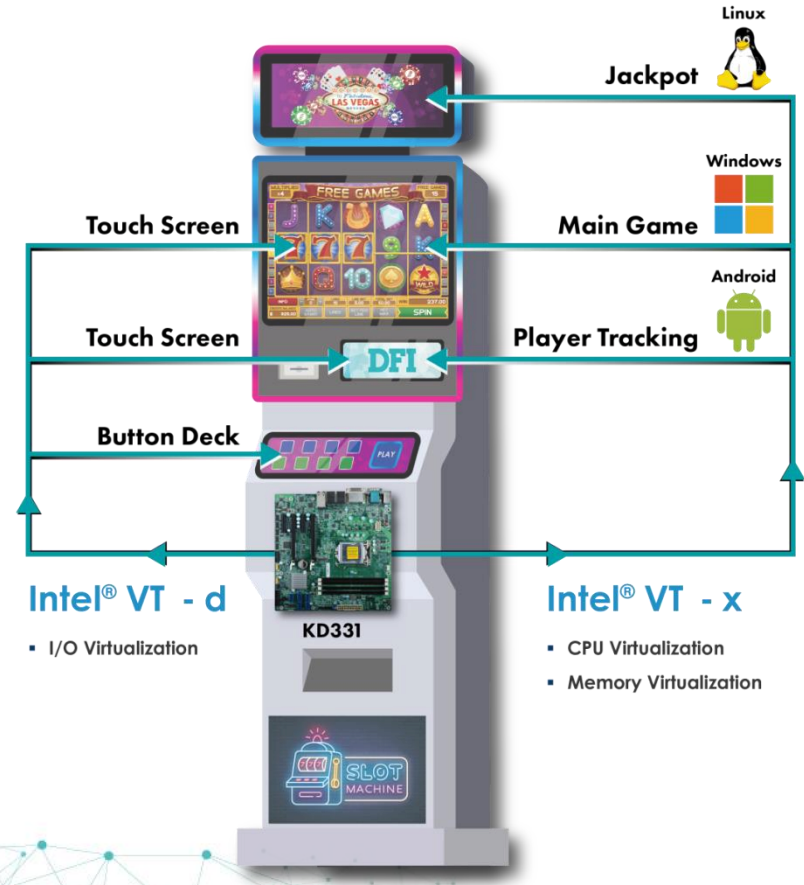
Intel Workload Consolidation Concept in Gaming

- **Highlight**

- 7th gen Intel Core Processor
- DDR4 UDIMM memory up to 64GB
- Three independent displays w/ Intel graphics virtualization
- Independent IO for logic box and player tracking system w/ Intel virtualization for directed I/O
- 32 DI, 32 DO, 4MB NVRAM, 8 intrusion detection
- Three different OS running on Intel ACRN Hypervisor

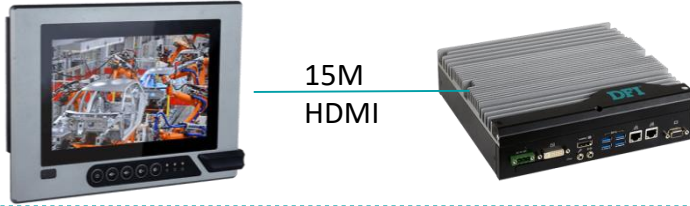
- **Application**

- Slot Machine, Roulette



Monitor Plan

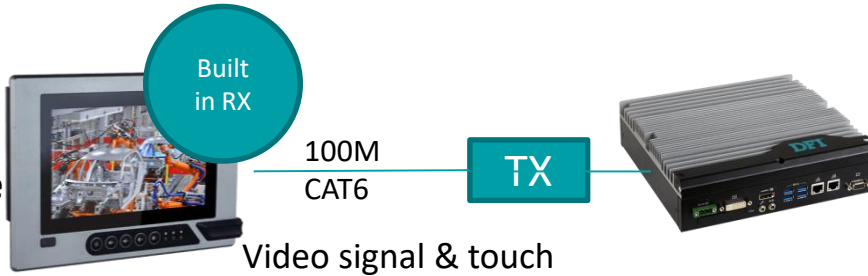
General Purpose



Product Features

1. Support touch resistive/PCT
2. Support 12VDC or 24VDC
3. USB Type C Powered if under 20W)
4. **Video Signals: VGA/ HDMI/ DVI**

Support Long distance



1. Support touch resistive/PCT
2. Support 12VDC or 24VDC
3. USB Type C Powered if under 20W
4. **Support 100M CAT6**

Support WIFI



1. Support touch resistive/PCT
2. Built in battery
3. **Support wireless communication**

Intel Hyper



DFI Box PC

HDMI 15M



Applications

Guest OS1

RX



Applications

Guest OS2

TX

CAT6 100M



Applications

Guest OS3



Hypervisor

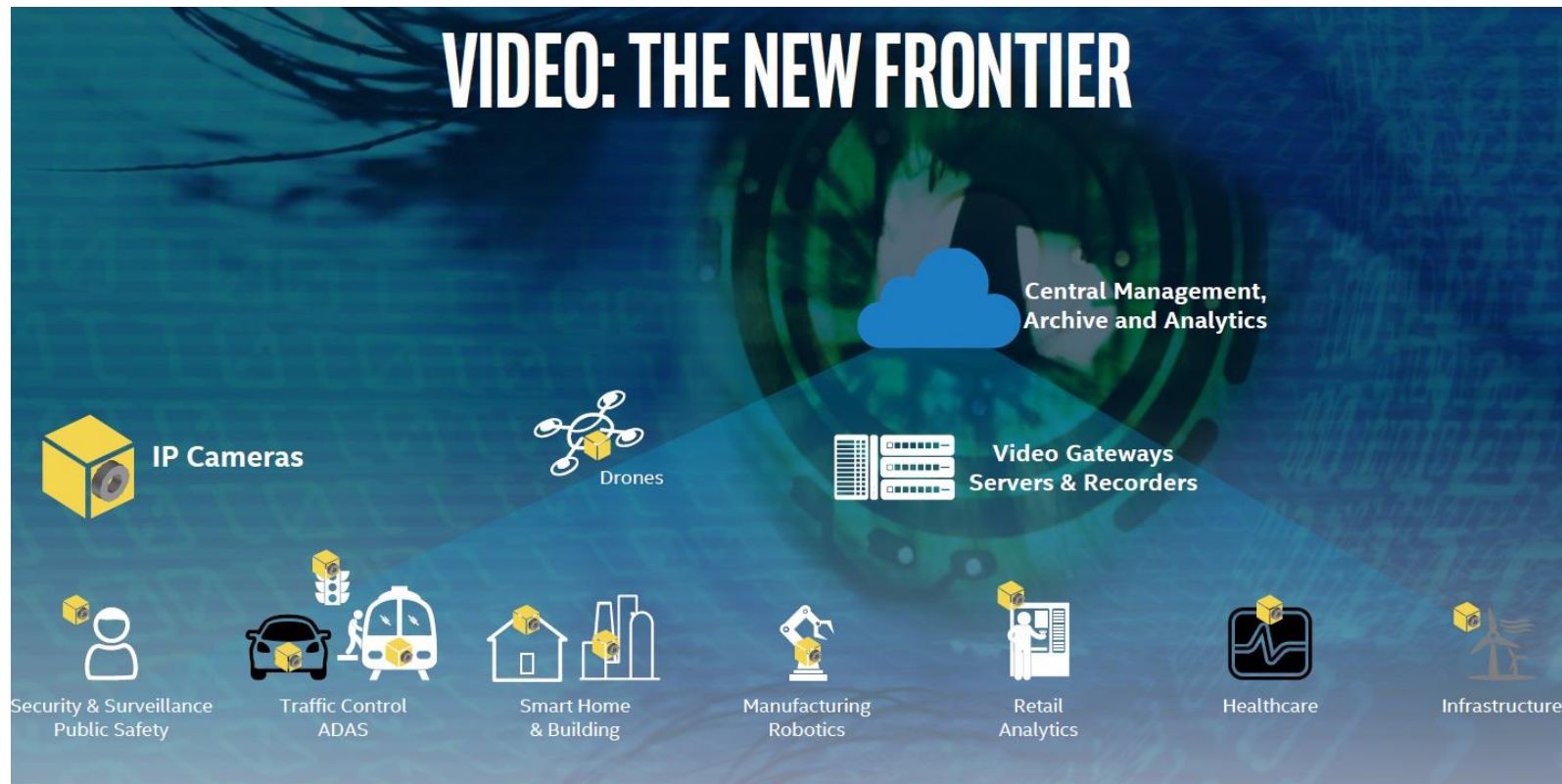
Multi-Core Intel Architecture with Intel Virtualization Technology

AI



- AI could be applied to **many different areas** depending on the needs
- **Different application** for different AI computing performance
- **AI everywhere** needs more various solutions
- Small and fanless system with high-end graphics

VIDEO: THE NEW FRONTIER



New Product Highlight

Intel Xeon SP- PURLEY & CASCADE LAKE



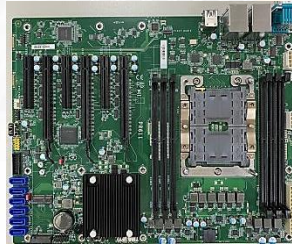
PR810



PL610



PR610



PR611

- Extreme CPU Performance, up to 24 Core
- DDR4 192GB/384GB Reg-DIMM
- Multi PCIe x16/x8
- PCI for Motion card
- 10GbE LAN
- Intel Optane DC persistent memory support
- BMC for IPMI remote control (Flexible BMC module)



Industrial Controls & Automation



- Machine Vision/AOI/Motion
- Measurement Controllers
- Machine Learning/ Deep Learning

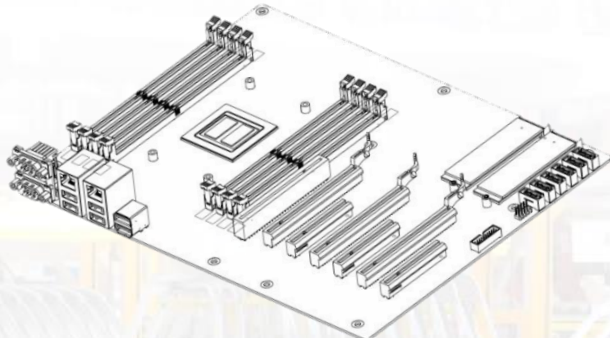
Medical Imaging



- Medical Equip (MRI, X-Rays)
- Image guide systems

New Product Highlight

AMD EPYC 3000



SO630

AMD Snowy Owl **EPYC 3351/3451** CPU

8 DDR4 Quad-Channel up to **256GB**

3 PCIe x16, 3 PCIe x8 (share w/ x16 each), 1 PCI

2 M.2, 5 SATA3

Performance Comparison

with Intel Xeon -D

EPYC™ EMBEDDED 3000 PERFORMANCE LEADERSHIP



Application Market



Medical Imaging System

- Medical Equip.
- Clinical Workstation
- MRI, X-Rays, CT

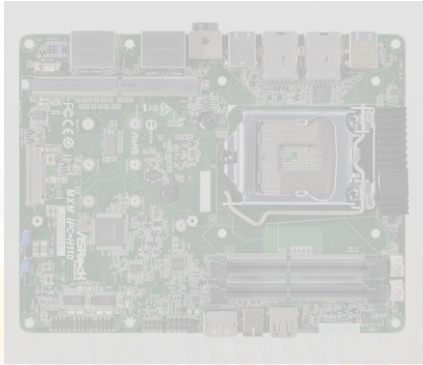


Industrial Controls & Automation

- Machine Vision/AOI
- Surveillance
- Machine Learning/ Deep Learning

New Product Highlight

Mini ITX w/MXM



Mini ITX w/MXM

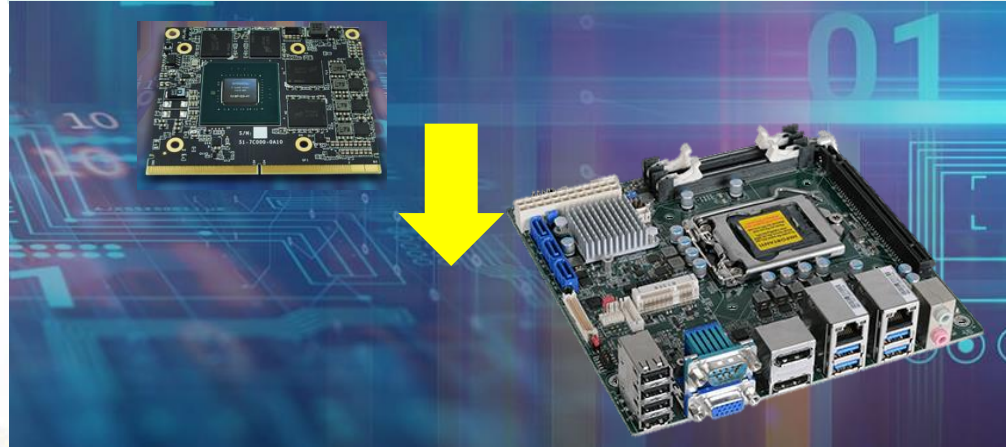
Coffee Lake 8th/9th Generation platform

MXM3.0/3.1 type-A/B

5 external displays, 5 Ethernets(opt.)

4 USB3.1 Gen2 and 2 M.2 Key-M(Q370)

Compact, thinnest MXM for Graphic performance demanding application



**Application
Market**



Low profile Mini ITX w/MXM



Embedded AI & Vision Computing

New Product Highlight

3.5" SBC CS551



CS551

Coffee lake-S, Up to 6 core / 12 thread.

Xeon / ECC RAM by C246 PCH.

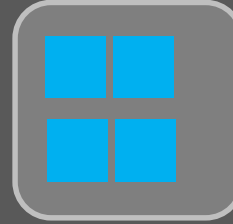
Fan & Fanless design for different application

M.2 2280 PCIe x4 support

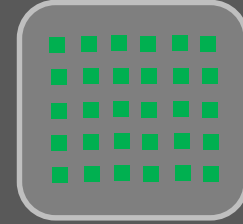
Performance Optimized

Co-Processors

CPU



GPU



Application
Market



High computing Vision processing

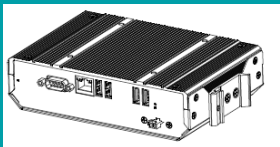


Space constrained w/CPU/GPU loading

Edge AI Product Plan

Edge AI Gateway Box

EC800-AL-AI (Planning)



- Intel Apollo Lake E3900
- LPDDR4 4GB/8GB
- Intel Movidius Myriad X



Edge AI Inference Systems

EC532-KD-AI (Developing)

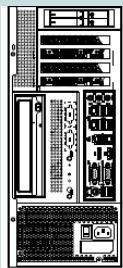


- Intel Kaby Lake Core-i7/i5/i3
- SO-DIMM DDR4 up to 32GB
- 1x PCIe x16 for GPU card up to 260W

Rackmount GPU Server

RM641-PR810

- Dual Intel Xeon Scalable Series
- 2x PCIe x16 for GPU
- PSU 1,600W/2,000W 1+1 redundant
- IPMI remote management



WM345-CS (Planning)

- Intel Coffee Lake Core-i
- 1x PCIe x16 for GPU
- PSU 650W 1+1 redundant
- Anti-vibration

EC500-KD-MXM (Planning)



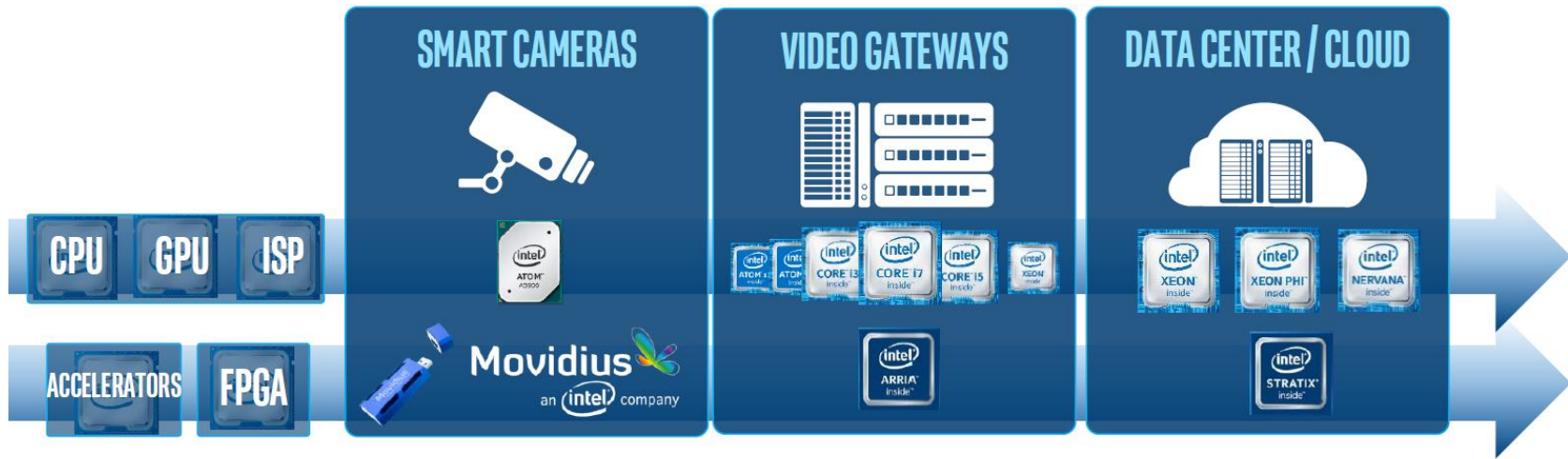
- Intel Kaby Lake Core-i7/i5/i3
- Rugged fanless, anti-vibration design
- SO-DIMM DDR4 up to 32GB
- Built-in NVIDIA MXM
- System power 300W



INTEL AI SOLUTION



END-TO-END DISTRIBUTED INTELLIGENCE



← ACCELERATE & DIFFERENTIATE WITH INTEL SOFTWARE TOOLS →

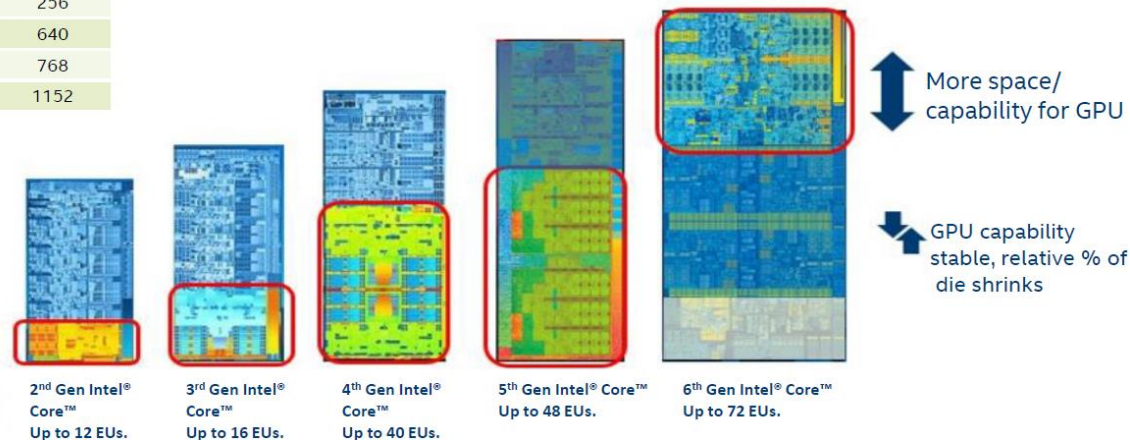
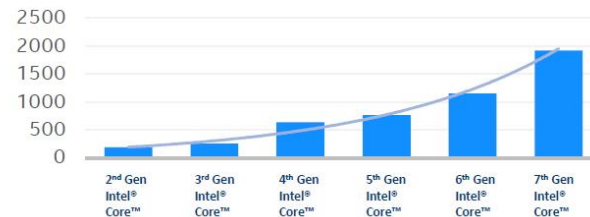
Intel CPU Graphic Enhanced

Intel integrated Graphics

- Increasing range of capability/power choices
- Increasing % of total processor capability in graphics

Intel® Core™ Generation	Total EUs	FLops/Clock per EU	Total FLops/Clk
2nd Gen Intel Core	12	16	192
3rd Gen Intel Core	16	16	256
4th Gen Intel Core	40	16	640
5th Gen Intel Core	48	16	768
6th Gen Intel Core	72	16	1152

Peak FLops/Clock for Best GPU



Intel AI Accelerating Units

AI Core M2

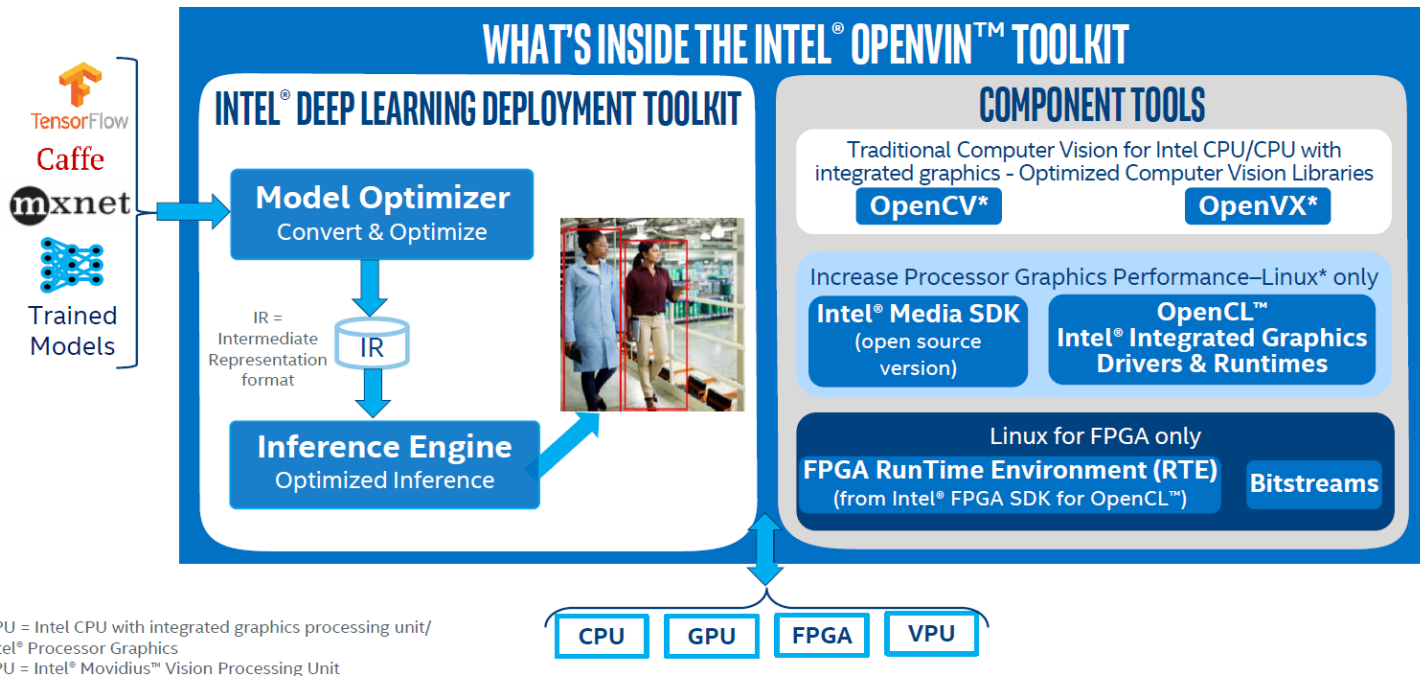


AI Core



Intel AI SW Environment

Intel® OpenVINO™ Toolkit & Components

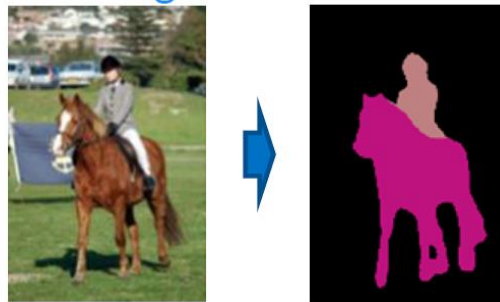


Inference Engine Samples – Public Models

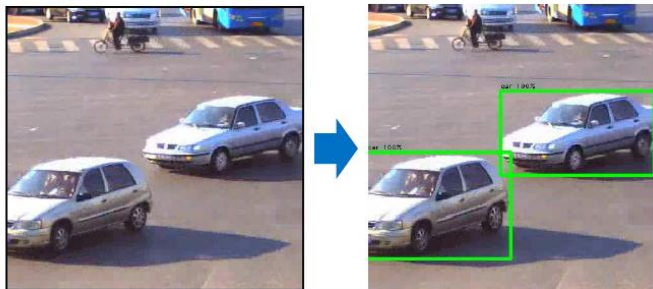
Image Classification



Semantic Segmentation



Object Detection



Neural Style Transfer

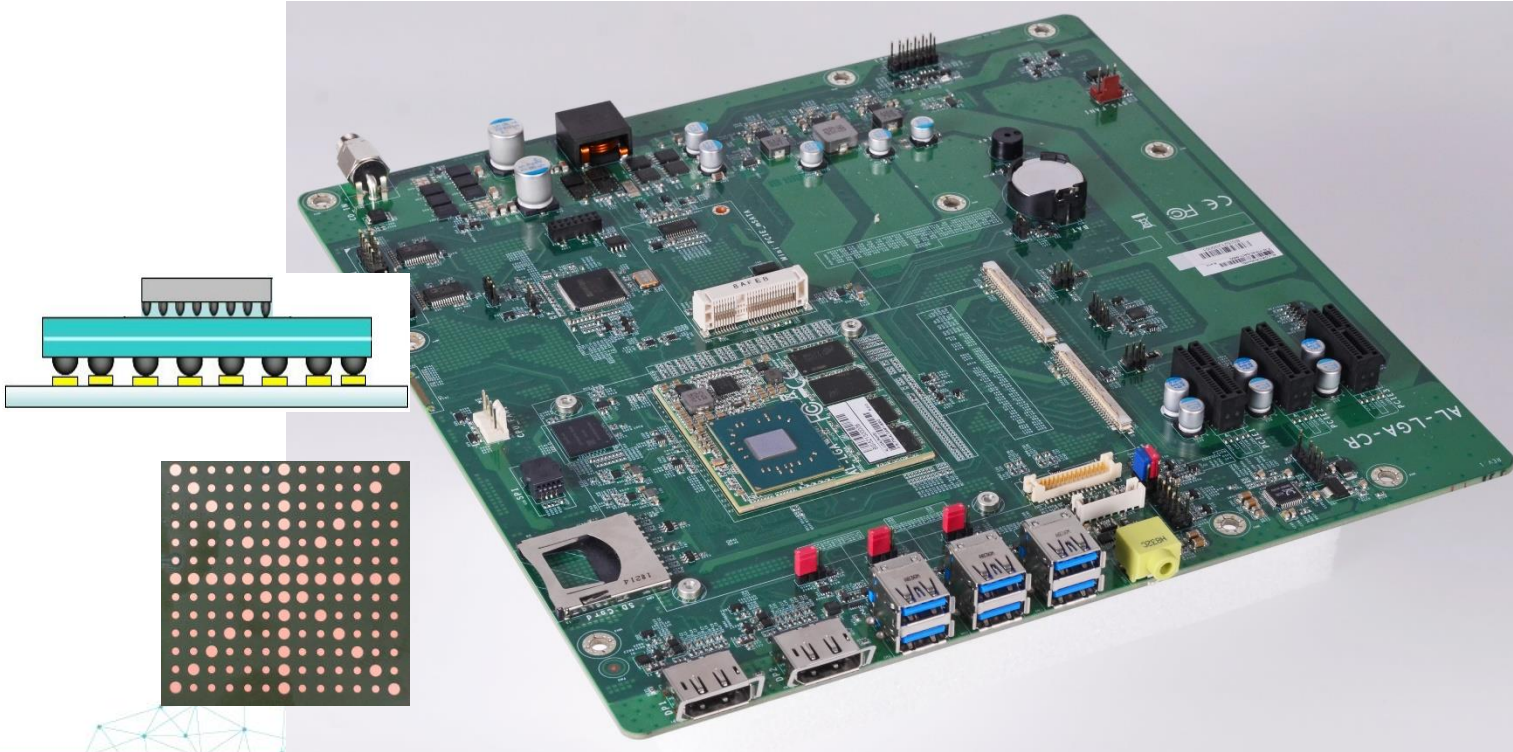


DFI BGA SOM FOR RUGGED SOLUTION

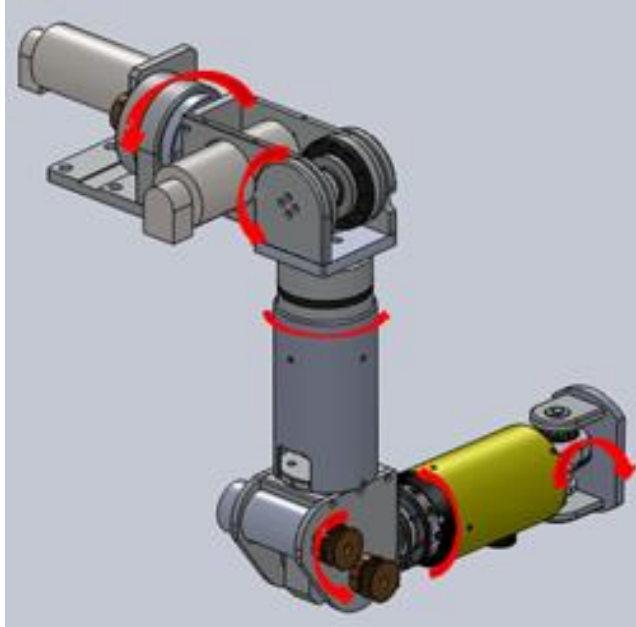


SOM module

- Intel Apollo Lake Platform
- Directly soldering, connector free.



SOM for Rugged Application



DFI VOICE CONTROL



Voice control



RELAJET

洞見未來科技

- ✓ Voice command with Voice Identification
- ✓ Analytics of environment and crowd



XMOS

Voice control option list

**Support voice control
by USB2 I/F**



Select your application



VCC board, circuit type ,
for Box PC / stand-alone usecase.



VCL board, linear type for panel PC

Adding features list

- Relajet Voice profile / Command kit
- Key word customization
- Up tp 7x Microphone array
- Speaker out support

DFI VARIOUS SOLUTIONS




Different Platform

AMD/i.MX8/Qualcomm



RYZEN™ EMBEDDED V-SERIES
V1000 APU
Next gen SoC featuring superior performance and high-performance "Zen" CPU Core

4C/8T Zen Cores 14nm	3.6 TFLOPS*	4 4K Displays	4K60 Decode & Encode	Dual 10GE	Leading Edge Security SME/SEV	Scalability 12W – 54W
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i.MX 8
Advanced Graphics & Performance



RUGGEDIZED DESIGN FOR EXTREME APPLICATIONS



Wide Temperature

- -40°C-85°C Durability
- Optimized Thermal Solution
- HALT Test



Wide Voltage

- 9-36V DC Input
- Over Current Protection



IP65-Rated Protection

- Dust/Particles Protection
- Water Protection



Anti-Vibration/ Shock

- Stable and Reliable Performance
- IEC60068
- Frequent Vibration/Shock Resistance

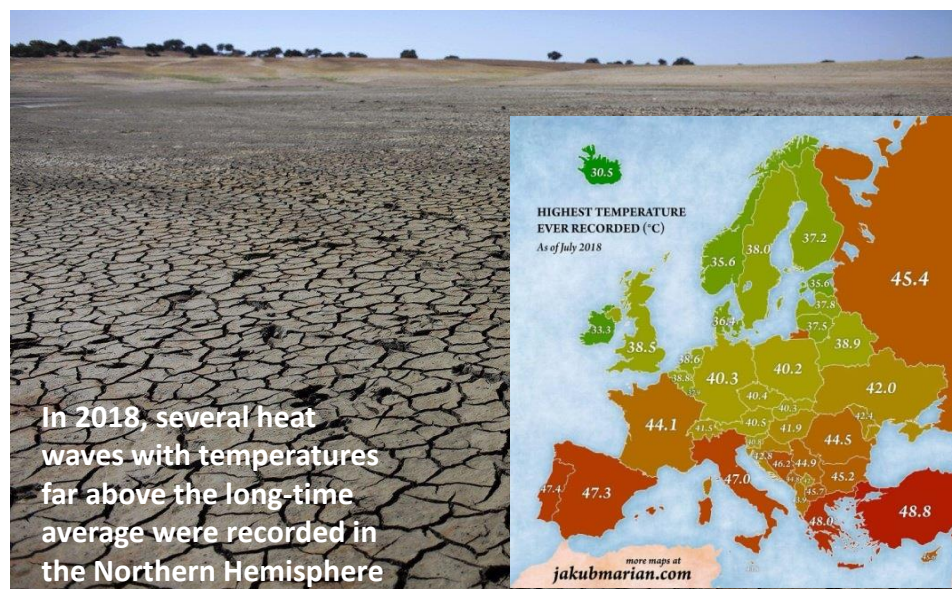


Conformal Coating

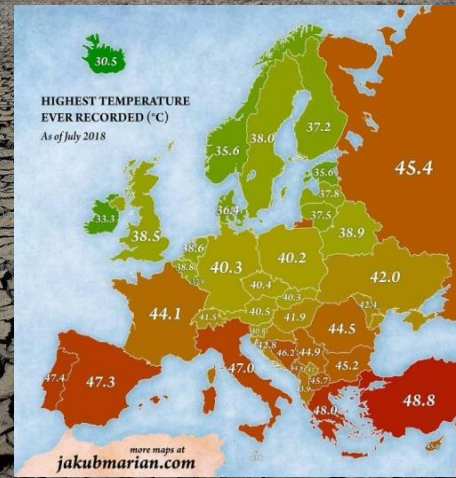
- Parylene/Conformal Coating
- Excellent Adhesion
- Corrosion Resistance



The #PolarVortex is triggering the coldest arctic outbreak in at least two decades this week in parts of the Midwest



In 2018, several heat waves with temperatures far above the long-time average were recorded in the Northern Hemisphere



-50C

Board level-Now	Board level-New
0~60C	-5~65C
-20~70C	-30~80C
-40~85C	-50~ <u>90C</u>

+90C

DFI

Thank you