PFUの組込みビジネスと
マスカスタマイゼーションへの挑戦

PFU’s Embedded system business and challenge to mass customization

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1. はじめに  
Computer from Ishikawa

2. エンベデッド製品紹介  
Embedded Computer

3. 新しい取り組み  
New Product for IoT

4. IoT想定  
IoT Forecasts

5. まとめ  
Conclusion
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1-1. PFU is

A technology-led company that provides IT products and services, mainly focusing on technologies related to the boundary between analog and digital
Over 1 Million Embedded Computers
From Ishikawa

To World Wide Customer
1-3. PFU’s Achievement on Embedded

More than 100 companies of customers
1-4. Embedded Market

- Medical
- Semiconductor Manufacturing
- Machine Tool / Robot
- Telecom
- Others
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2-1. Embedded Computer

- **AI/AW**
  - Embedded Computer
    - AR8000 Series
  - Option Cards
    - AI Series

- **AR**
  - Embedded Computer
    - AR6000 Series
    - AR4000 Series
    - AR2000 Series
    - AR1000 Series

- **AM**
  - Board Computer
    - AM500 Series
    - AM300 Series
  - System on Module
    - AM100 Series
    - PD2200/2300 Series
  - Storage
    - AW Series
Intel based Board Computer over 23 years

System on Module AM100 Series

AM105 model 235K
AM120 model 215L/210L

Board Computer AM300 Series

Mini-ITX form factor

Board Computer AM500 Series

3U CompactPCI

AM530 model 210L
2-3. AR Series (Ready-made PC)

Intel based Embedded PC over 14 years

AR8000 Series

AR6000 Series

AR4000 Series

AR2000 Series

AR2100 model 100K

AR2200 model 120L

AR6100 model 130J

AR6200 model 140K

AR4400 model 100H

AR4400 model 200K

AR8300 model 300L/310L

AR8300 model 320L
2-4. Customized Board/PC

**Customized Board**
- Xeon Board
- Multiple CPU board On Carrier
- Specific to Customers
- CompactPCI

**Customized PC**
- 2U Rack Mount
- Multiple CPU module In 1 chassis
- 6 x HDD PC
- Touch Panel PC
2-5. Issues of Embedded Business

当社エンベデッドの解決課題
Our Mission

A. IoTにどう挑戦するのか
How to challenge on IoT?

B. この多品種製造をどうこなすのか？
How to deal with multi-product manufacturing?
## Agenda

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3-1. IoTにどう挑戦するのか
How to Challenge on IoT?

Industrial Network

Embedded Computer
AM, AR

Storage

Remote Maintenance

2018/7/4
機械に組み込むコンピュータ
深層学習機能を搭載
Computer embedded in machines
Mounting deep learning function

2018/9/27
産業用ネットワーク搭載の
セットモデル
Industrial network model
in sets with AR products

2018/11/6
産業向けコンピュータ
ストレージ機能の充実
Computers for industry
Enhance storage function

2018/10/10
車載向けシステム参入
まず開発車用機器
Entry on-vehicle system
For development first
3-2. Option Cards/Software

**Industrial Network**
- EtherCAT
- MECHATROLINK-Ⅲ

**Storage**
- RAID1 by Software
- HDD
- Storage for Embedded PC

**Deep Learning**
- Deep Learning Acceleration
- NVIDIA GPGPU

**Remote Maintenance**
- RMS (Remote Management System)
- SysMon (System Monitoring Software)
見える化/Visible：監視強化/Enhance monitoring
3-3. システム監視製品/System Monitoring Products

EmbedWare /SysMon
ローカル監視
Local Monitoring

BMC
(Baseboard Management Controller)

リモート監視
Remote Monitoring

RMS
_Remote Management System_
システム統合監視
System Integrated Monitoring

Gateway
Server
Remote Controllable

Planning

SysMon
BMC
SysMon
BMC
SysMon
BMC
Applicable to various control for such as semiconductor producing equipment or machine tools.

Provide certain synchronous control for such as torque, velocity, or position. (Control devices for motion or rolling)

Connect many slave devices (max. 2048). Various slave devices are provided.

Advantage of motion control. (Flexible and High Accuracy)

Smart Factory
Realize **small size** and **low power consumption** required for industrial embedded AI and **edge computing**.
(Inference Engine Card)

- Mountable in a PC with PCI slots including small size controllers (AR2100, AR4400, etc.).
- Perform inference processes on the PCI card engine. It leads to CPU offload and low power consumption (25W).
- Compatible with the deep learning framework (Chainer®). *Other frameworks are also arrangeable.
- Current AI applications are useable.
- Tuning according to a purpose. (for a fee)
- Supported OS : Linux or Windows.
- PCI Express x8, standard height, and half length.
- Long-term supply, long-term maintenance.
Provide deep learning environment according to the purpose of use.

Case 1
Large machine application

- Learning Data
- Image, Video, etc.
- AR8000 Series
- Deep Learning Accelerator Card
- GPU
- Learned Information (Learned Parameter)

Case 2
Small device inference application

- Learning Data
- Image, Video, etc.
- AR2000/4000 Series
- Deep Learning Accelerator Card
- Learned Information (Learned Parameter)

PFU provides nVIDIA card (GPU). Providing in sets with PFU's AR products (PCs) certifies stable operation.

Deep Learning Accelerator Card lowers power consumption. Efficient inference process with a small PC environment.
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4-1. Connected Industriesへの取組み
Efforts to Connected Industries

- Office Network
- Control Network
- Field Network

Efforts to Connected Industries

Sensor data/Control data
HMI
Log data
Maintenance terminal
SCADA
Deep learning
EtherCAT
Mechatrolink
Sensing
4-2. 組込みIoT /Embedded IoT

装置内蔵AIは、装置の長期供給が求められる
Long-term supply is essential for AI in equipment

応答時間保証しながらコストダウンもしたい
Want to reduce costs while guaranteeing response time

Embedded IoT

Top network applications

エッジAI
Edge AI

データ蓄積
Data accumulation

セキュリティ対策
Security measures

リアルタイム制御
Real time control

Deep learning

Office Network

Control Network

Field Network
4-3. IOT Platform

IoT Platform

PFU's Trial

PFU 「Smart Factory」
4-4. 5Gによる新たな産業変革
5G will change the world

工場
Factory

放送
Broadcast

Smart Manufacture

病院
Hospital

Smart City

農場
Farm

テクノロジ

社会インフラ
Infrastructure

自動車
Car

放送
Broadcast

Stadium

低遅延
URLLC

多数接続
mMTC

多数接続
mMTC

多数接続
mMTC

多数接続
mMTC

高速・大容量
eMBB

高速・大容量
eMBB

高速・大容量
eMBB

高速・大容量
eMBB
4-5. 5G Network and Edge Computing

Cloud

Data Center

Core Network/Metro Network

IP Network

1. Network Edge

Base Station

MacroCell
SmallCell

2. Edge Device

Buildings
Houses
Cars
Shops
Buses
Factories
Factories
4-6. Requirements of 5G Edge Computing

1. Network Edge
   - Network Slice #0
   - SDN/NFV/OAI/ONAP
   - Linux
   - OS Virtualization
   - MultiCore CPU (Xeon)
   - Acceleration
   - 4K/8K Video Transmission

2. Edge Device
   - Edge Application
   - Windows/Linux/RTOS/VM
   - CPU
   - GPU/DL
   - Industrial Network
   - Wireless Network
4-7. Requirements of 5G Edge Computing

1. Network Edge
   - Network Slice#0
   - SDN/NFV/OAI/ONAP
   - Linux
   - OS Virtualization
   - Network Slice#0
   - Virtualization w. Storage
   - Storage
   - Security
   - Network slicing
   - Planning
   - 4K/8K card
   - Planning
   - Planning
   - Planning
   - Planning
   - Planning
   - Edge Application
   - Edge Device
   - CPU
   - GPU/DL
   - Industrial Network
   - Wireless Network
   - Storage
   - Endpoint Security
   - Small Computer
   - Deep Learning
   - Field network
   - Wireless
   - RAID
   - Planning
   - Planning
   - Planning
   - Planning
   - Planning

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4-8. Practice of IoT at our factory (Sensing/Control)

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**Pick up system**

- Pick up parts without returning
- Cart

**Support System**

- Traceability
- Line side Storage
- Pick up system
- Display
- Box
- Tool
- Method

**FAT system**

- TP auto download
- Traceability
- Display
- Line side Storage

**System components**

- Pick up system
- Support system
- FAT system

**Diagram**

- Diagram showing the integration of IoT systems at the factory.
4-9. Practice of IoT at our factory (visualization)

Order

Kitting

Assembling 1

Assembling 2

Assembling 3

Function

Aging

Inspection

Packing

工場出荷試験/Factory Acceptance Test (FAT)

Camera

Position sensor

Information aggregation

Visualization Between steps

組立状況
Assembly situation

次工程への
投入タイミング把握
Understand input timing

梱包状況
Packaging status

test situation

Preliminary setup of work

組立①
Assembling 1

組立②
Assembling 2

組立③
Assembling 3

機能試験
Function

高温試験
Aging

最終検査
Inspection

梱包
Packing

次工程への
投入タイミング把握
Understand input timing

梱包作業の
事前段取り
Preliminary setup of work

組立状況
Assembly situation

試験状況
Test situation

Visualization In process

跟踪 tracking

製品毎作業時間
Product work time

個人每作業時間
Individual work time

滞留見える化
Make visible

習得の見える化
Make acquisition visible

工程每作業時間
processing time per process

工程バランス分析
Process Balance Analysis

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IoTへの組込みコンピュータを整備
Maintain embedded computer in IoT

a) センシング, 見える化, 分析
Sensing, visualization, analysis
Industrial Network, Remote Maintenance, Deep Learning, Storage

b) 5Gへの備え
Preparation for 5G

ぜひ 問い合わせください
Please contact us
http://www.pfu.fujitsu.com/embedded/
さぁ、組み込んでください。PFUという「信頼」を。