TOSHIBA

Leading Innovation

AIoT solution showcases

— Make your IoT devices different and profitable —

(TET) [NBC]
2018 Jul. 5th

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Information owner	TET NBC

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01

Showcase #1: Smart ePaper

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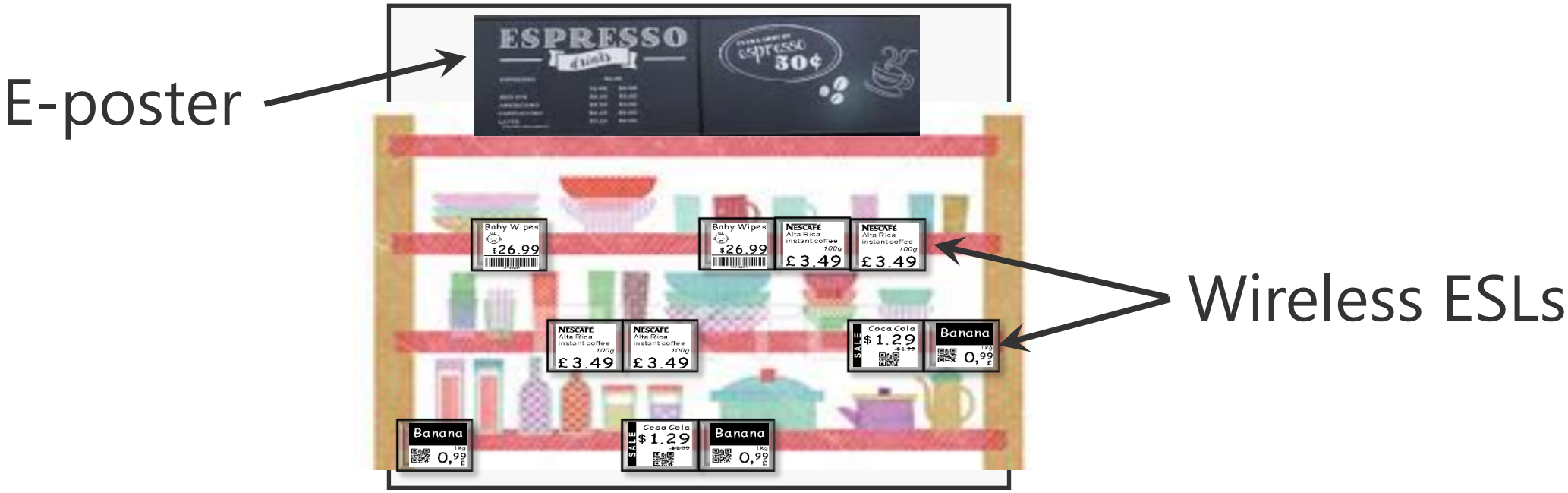
What is Smart ePaper?

POINT 1

Collaborate with Eink to develop wireless ESL and ePoster solution for Smart Retail market



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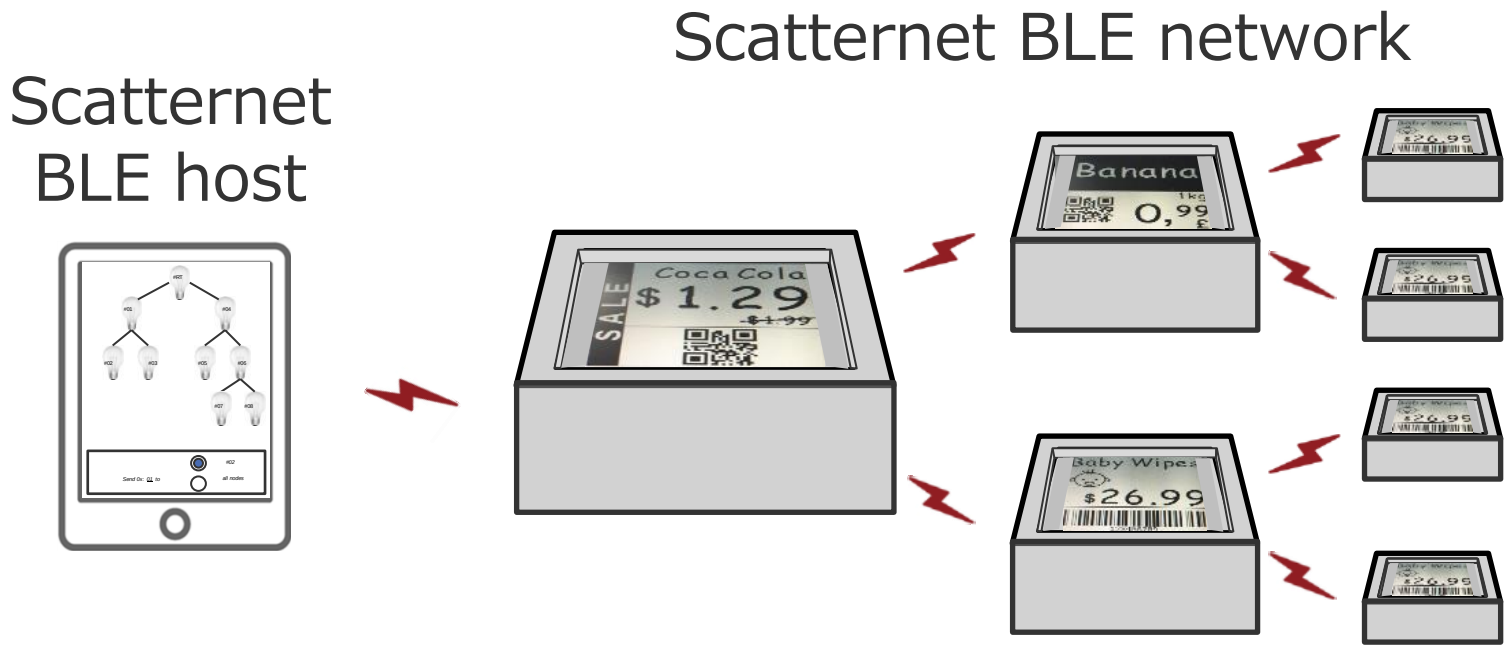
What is Smart ePaper?

POINT 2

ESL content is wirelessly updated via Bluetooth ICs and scatternet technology owned by Toshiba



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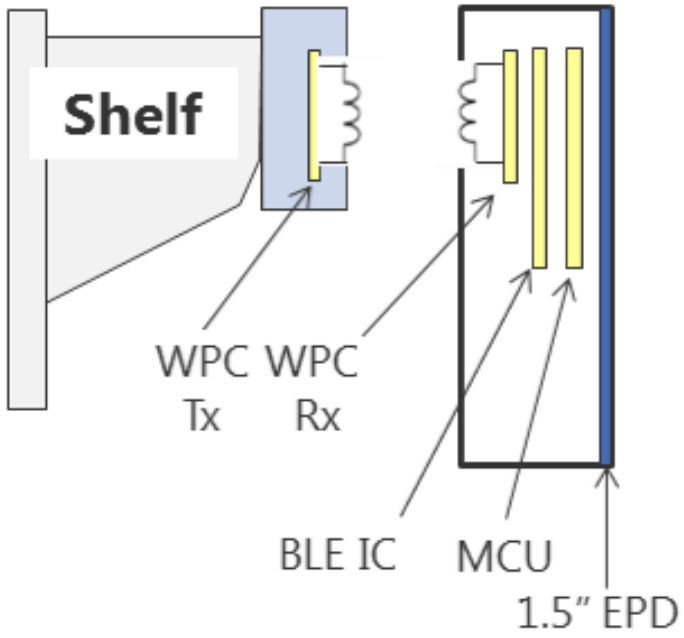
What is Smart ePaper?

POINT 3

ESL battery is wirelessly charged via Qi using Toshiba ICs



Wireless ESL

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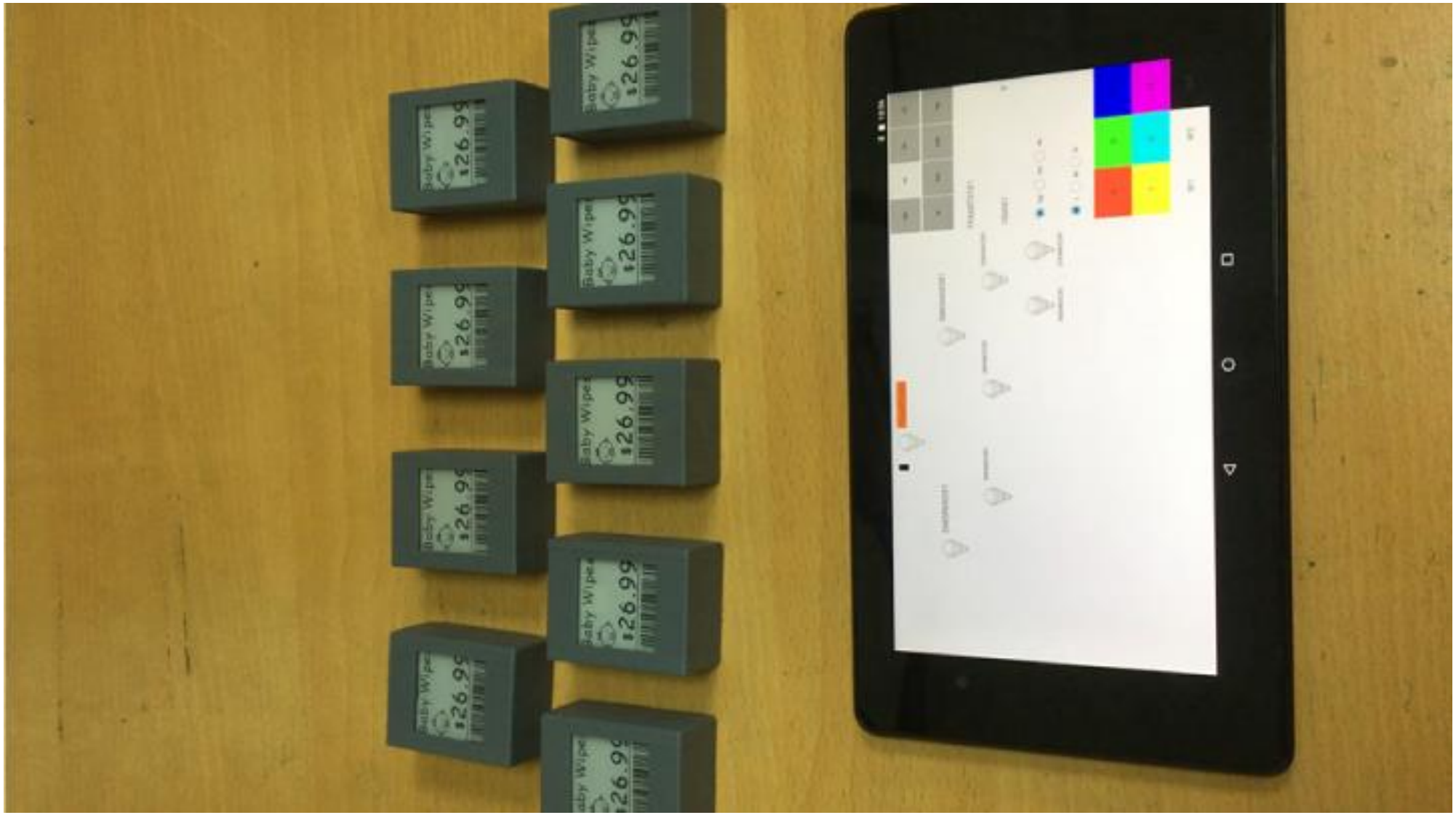
Smart ePaper demo 1.0



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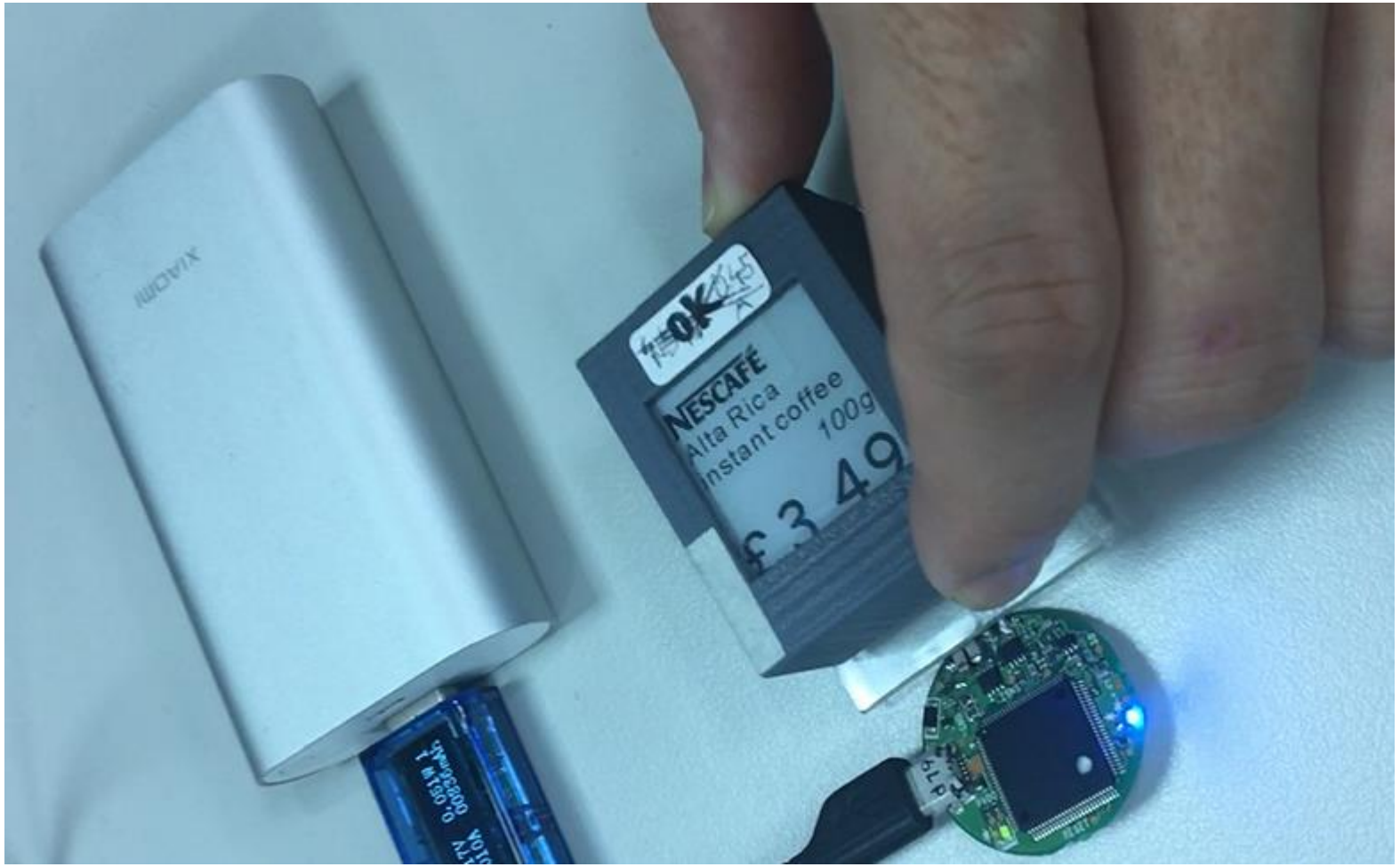
Smart ePaper demo 2.0



https://www.displaydaily.com/press-release/e-ink-to-showcase-flexible-display-solutions-at-sid-display-week-2018
https://eink.com/news.html?type=releasedetail&id=719&year=2018&page=1

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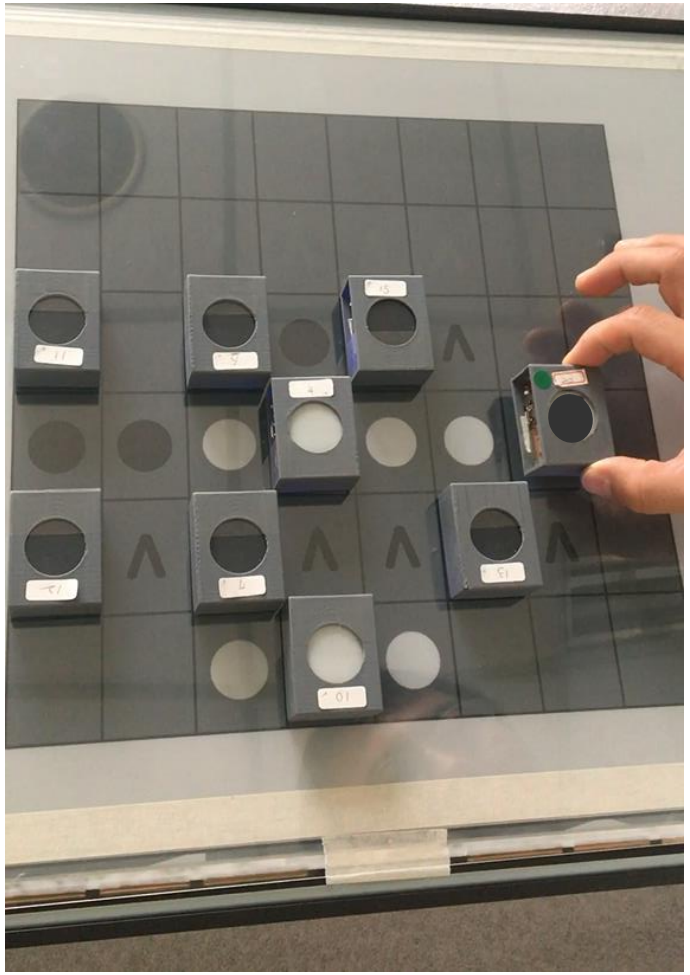
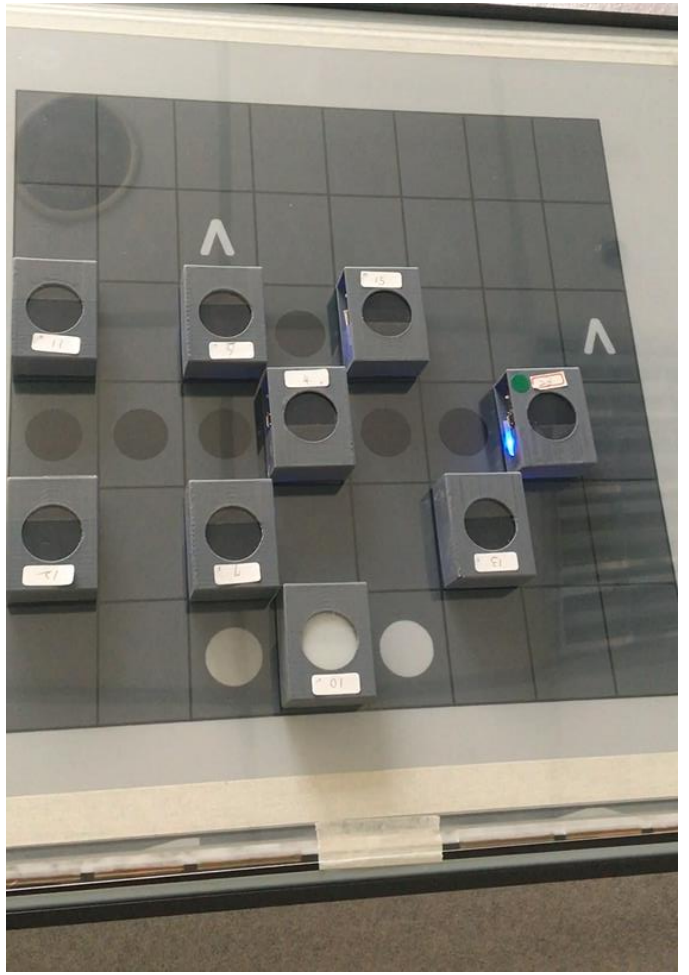
Smart ePaper demo 3.0

Before



After



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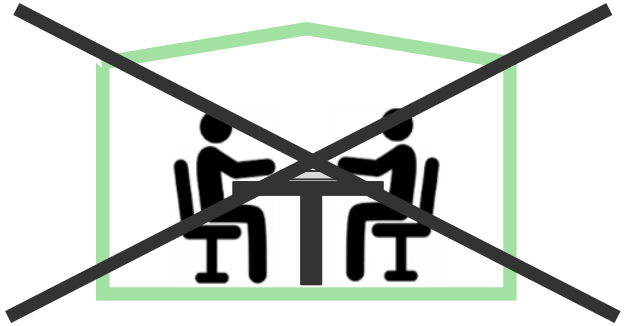
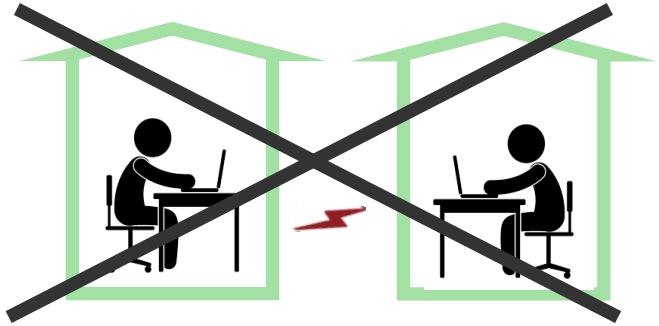
Smart Othello Concept



Not conventional board game…



Not virtual computer game…

But a tangible and yet virtually-interactive game !

	Conventional Othello	Online Othello	Smart Othello
Tangible?	O	X	O
Remote playable?	X	O	O

Best mix of conventional and on-line versions for elderly healthcare, to reduce dementia risk, etc.[1][2]

[1] http://bmjopen.bmj.com/content/3/8/e002998
[2] https://www.tandfonline.com/doi/abs/10.1080/07317115.2017.1370057?af=R&journalCode=wcli20

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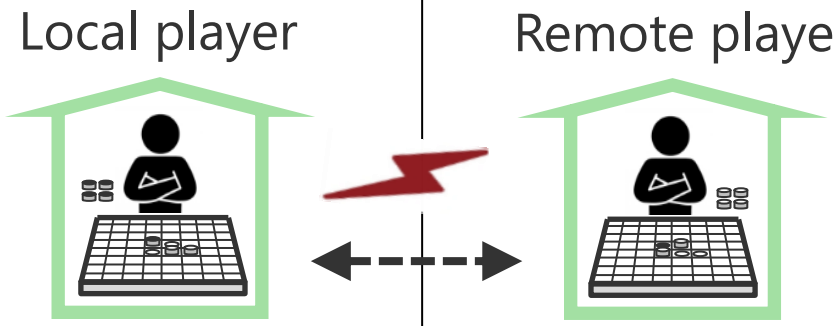
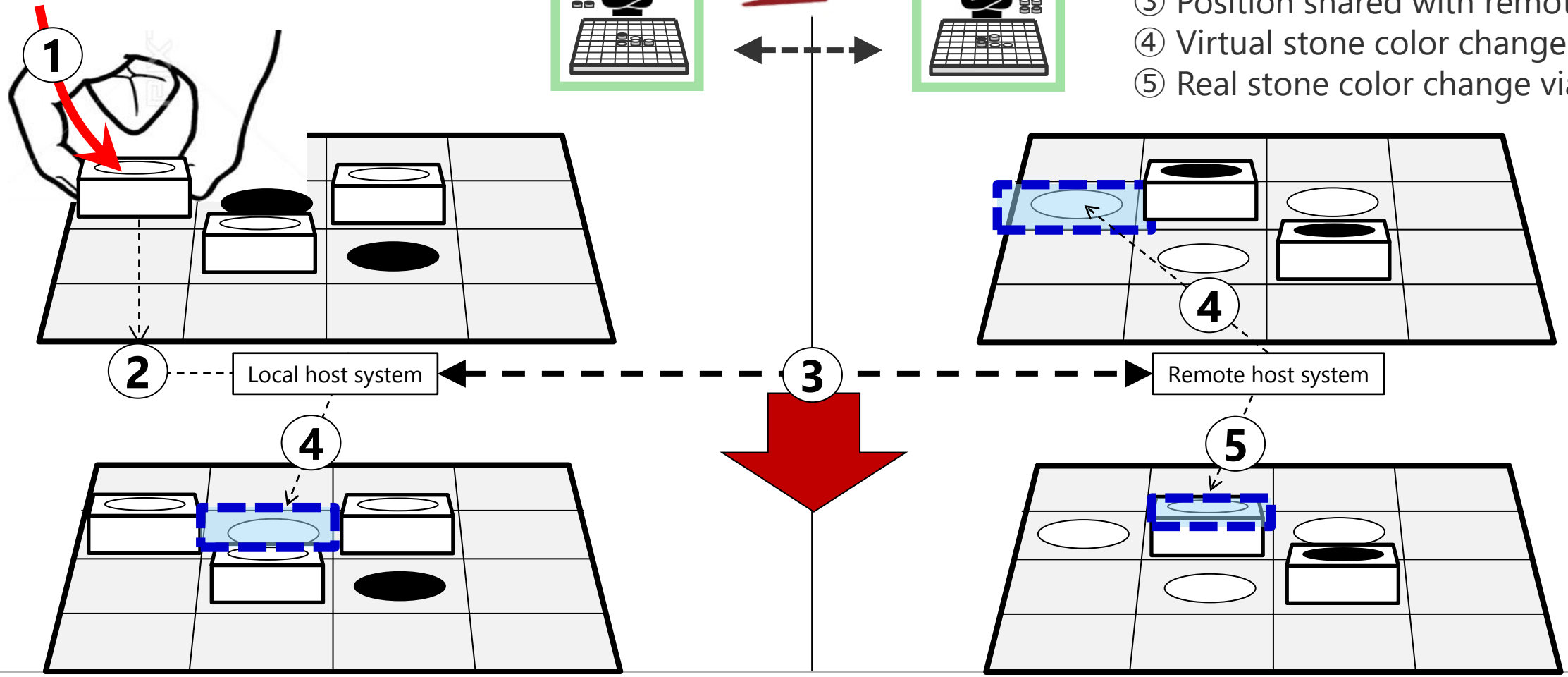
Smart Othello Operation

Real action by human player

Virtual action by computer



① Stone placement
② Stone being wirelessly charged
③ Position shared with remote
④ Virtual stone color change
⑤ Real stone color change via BLE



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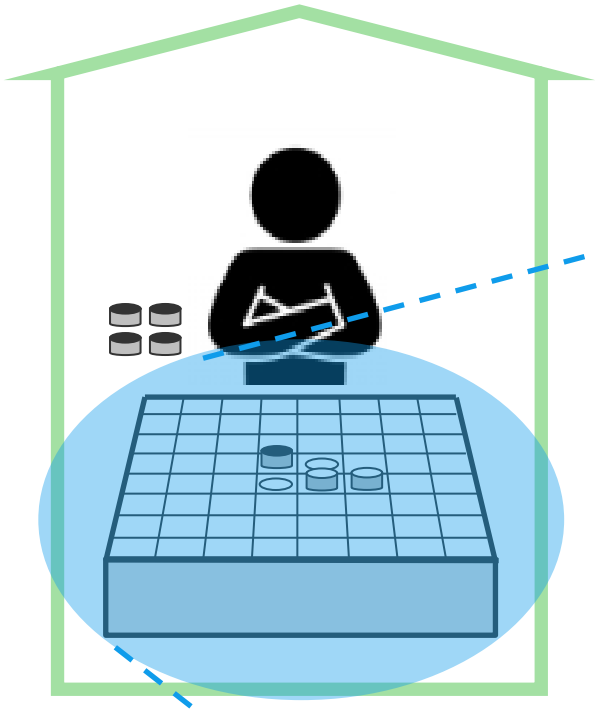
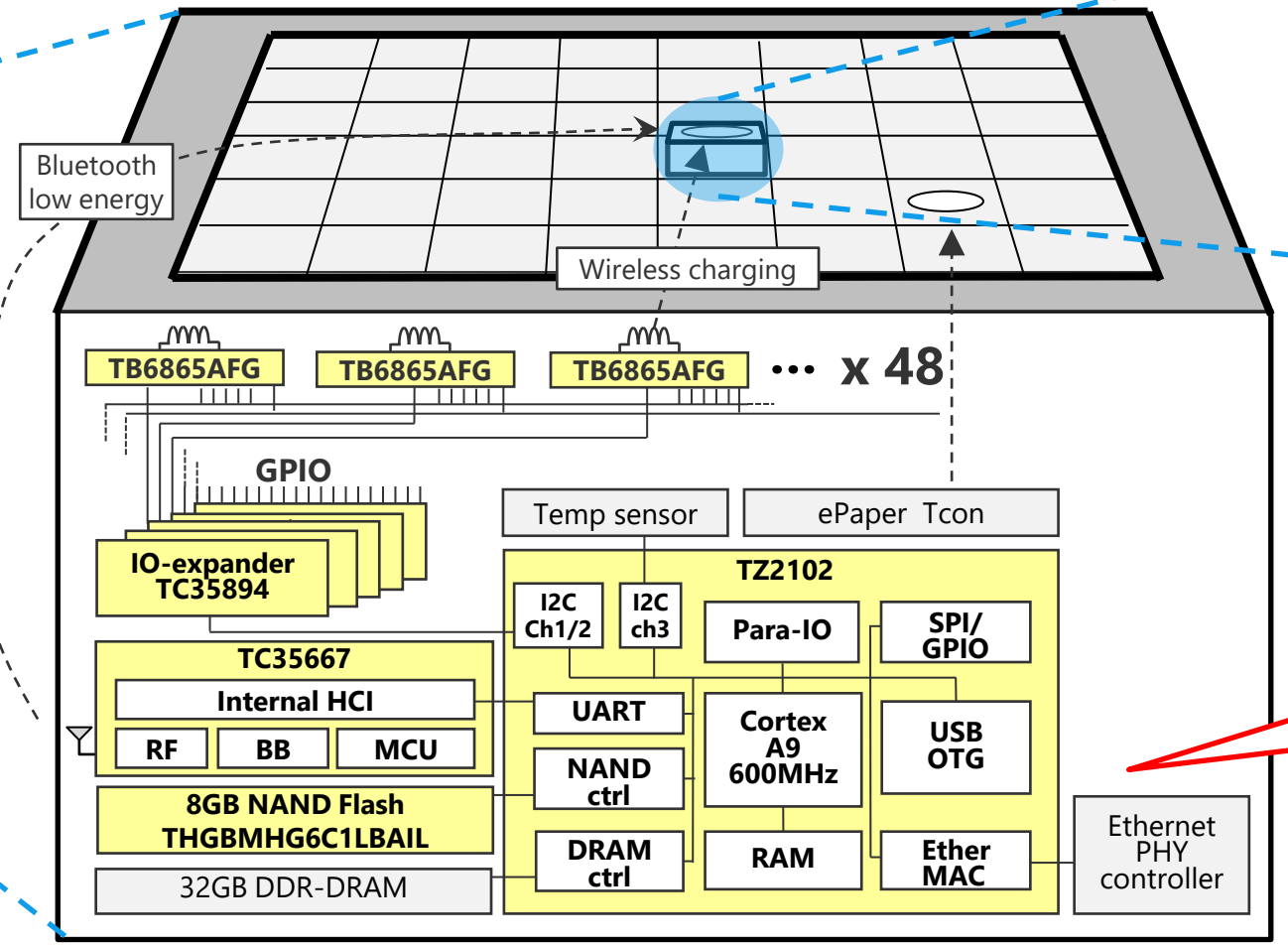
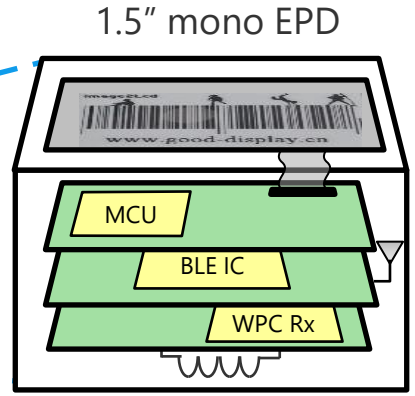
Smart Othello Hardware







Othello stone with 1.5" EPD

Othello base board with 31.2" EPD

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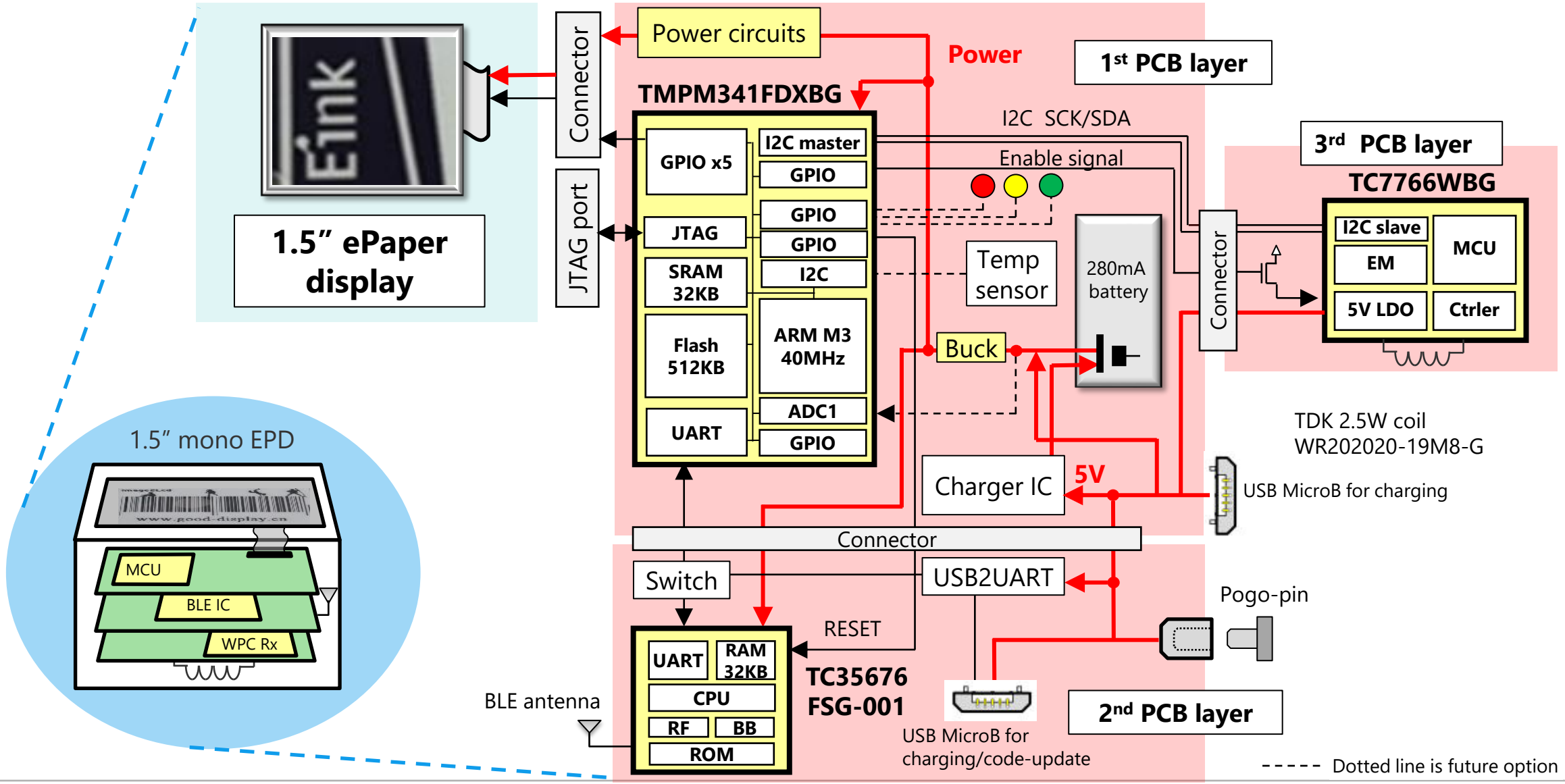
Othello Stone Design



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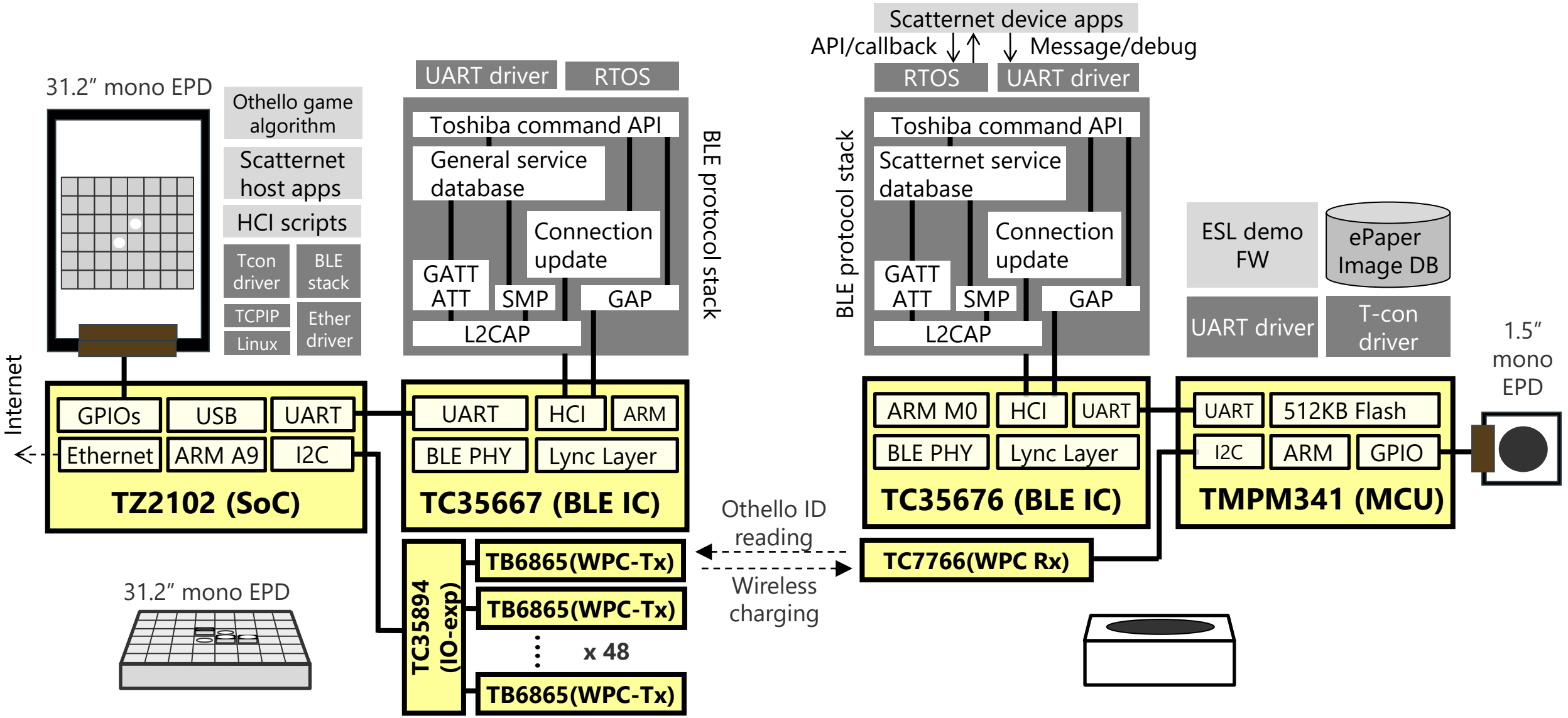
Smart Othello Software



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Smart ePaper summary

POINT 1

Collaborate with Eink to develop wireless ESL and e-Poster solution for Smart Retail

POINT 2

ESL content is wirelessly updated via Bluetooth ICs and scatternet technology owned by Toshiba

POINT 3

ESL battery is wirelessly charged via Qi using Toshiba ICs

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02

Showcase #2: Environmental Sensing Logger

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5 kinds of environmental sensors inside

It has 5 kinds of sensors including , temperature, humidity, air-pressure, shock, and luminance inside

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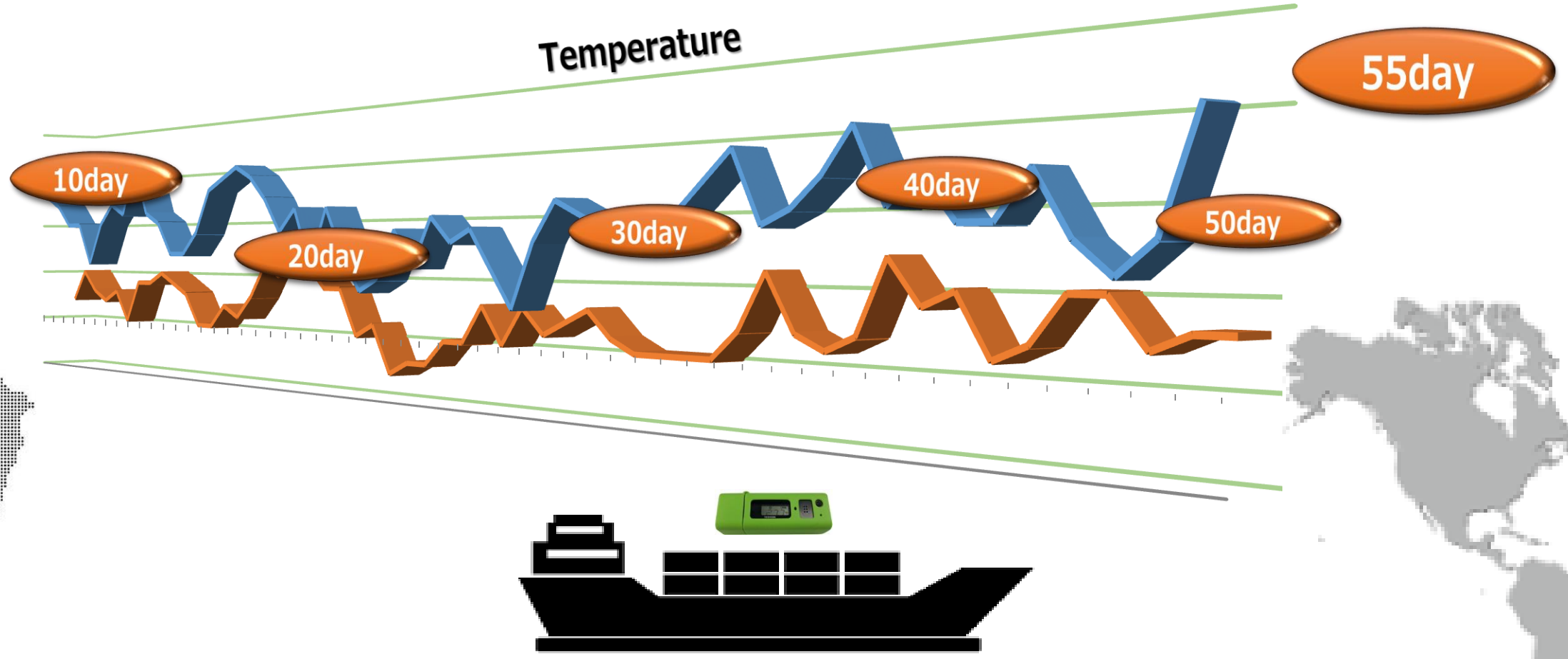
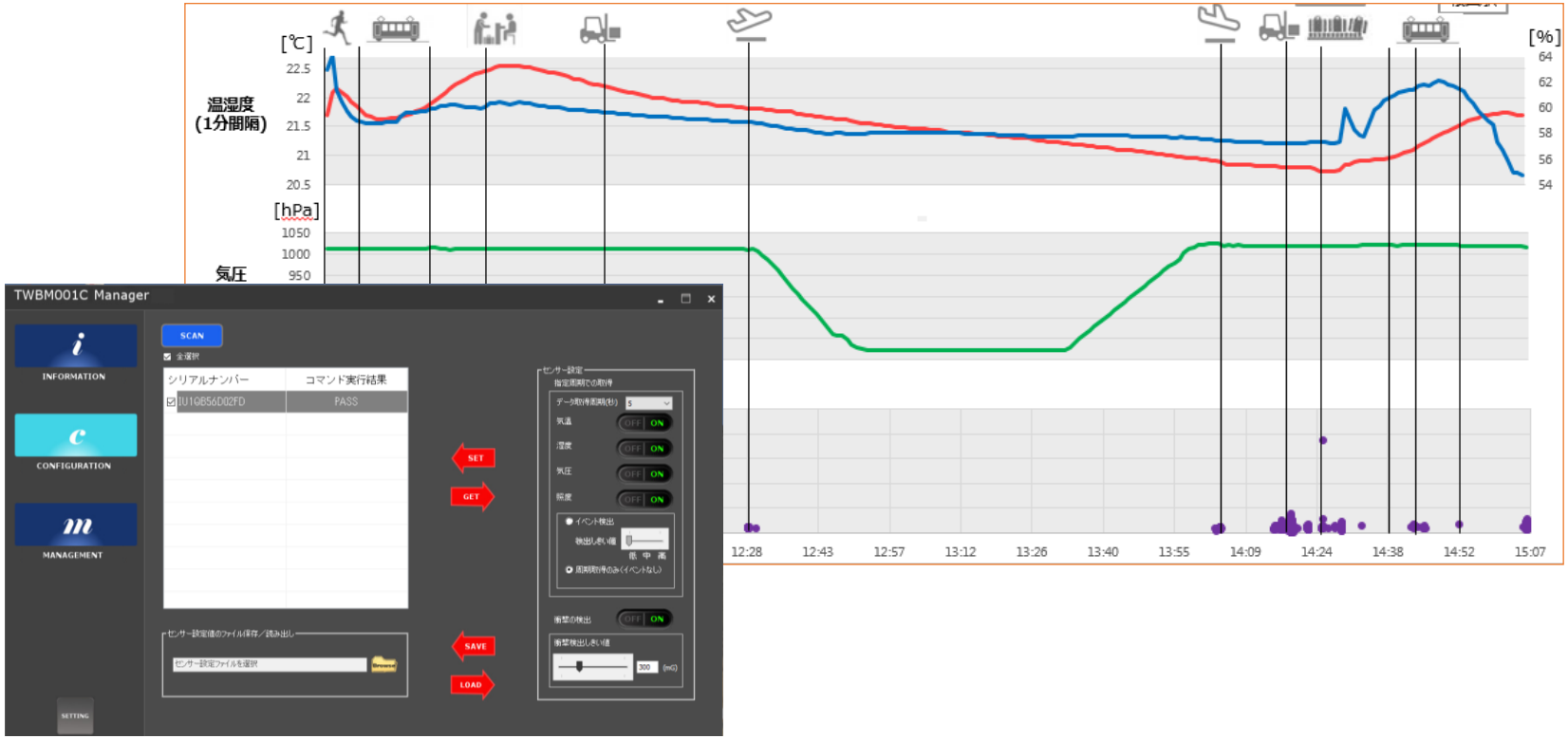
Long battery life



2 month of battery life * is realized by eliminating real-time data transmission capability.

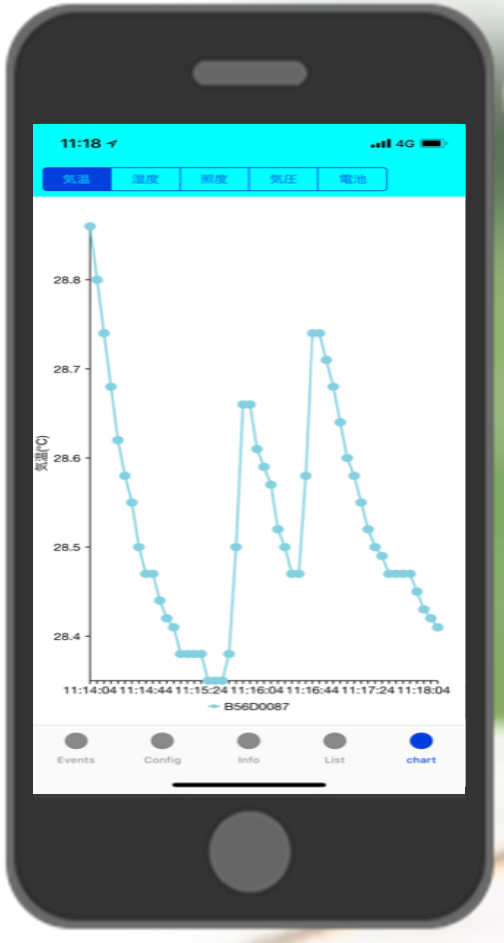
＊with sensing every 5 minutes

Dump all data to PC via USB



The recorded environmental data can be downloaded to the PC via USB. Environmental data analysis contributes to improve a comfortable environment.

Dump all data to PC via Bluetooth



Bluetooth enables for accessing a real-time data.

Product Specification

Toshiba Bluetooth Low Energy controller inside

Bluetooth™ 4.0

Low Energy

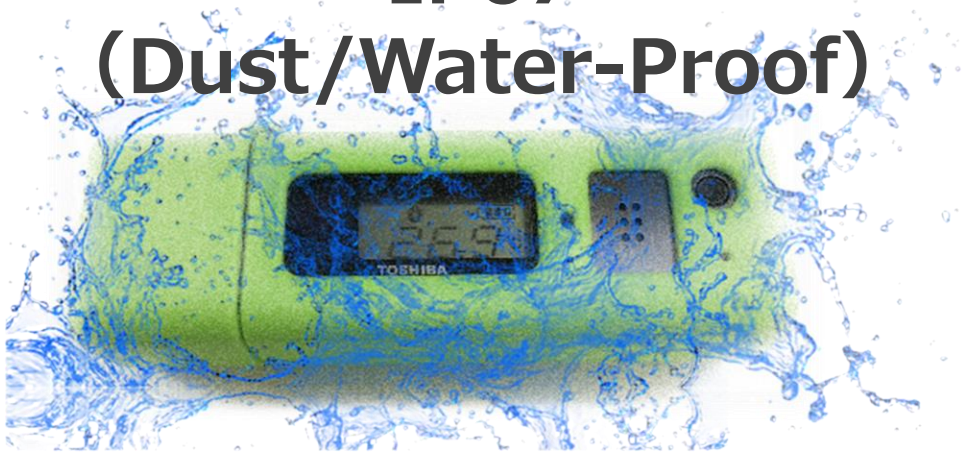
Item		Contents
Size (with Sheath)		100.0mm(L) x 36.0mm(W) x 31.0mm(H)
Weight (with Sheath)		Approx. 110 g
Battery		Li-ion battery 840mAh
Charging		USB Charging 4.75～5.25V, Max 500mA
Operating Temperature		-20 to 70°C
Function	Sensing (measurement range / Accuracy)	Temperature: -20 to 70°C / ±0.5°C (0 to 70°C), ±0.7°C (-20 to 0°C) Humidity: 0 to 100% / ±5.8%RH (10 to 90%@25°C) Pressure: 300 to 1100hPa / ±5.0hPa (800 to 1100hPa@25°C) Light: 0 to 65000 lux / *1 Shock: ±16G / *1
	Connectivity	USB, Bluetooth® SMART (Option)
	Security	Encryption Mode: AES-CBC, Block Size: 128bits
Operating Time		55 days (with sensing in every 5 minutes; The event can be logged approx. 220K times *2)
Ambient Condition, Certification		IP67 (Dust & Water-Proof), MIL-STD-810:Drop UL/VCCI/FCC/CE/IDA/RCM/SRRC, Bluetooth

*1: Light and Shock is the function for detecting a change, and the logged value are provided for reference purpose only.
*2: Both period and event can be logged approx. 240K times.

20

Various Standard Certifications

IP67
(Dust/Water-Proof)



RF/EMI Certification
(UL・VCCI・FCC・CE・IDA・RCM・SRRC・Bluetooth®)

RTCA DO-160
(Airborne Product & Equipment Standards)

MIL-STD-810
(Durability)

Environmental Sensing Logger Summary

POINT 1

Recurring business model to charge analyzed data amount at cloud, instead of selling hardware

POINT 2

A new concept of IoT devices to log big data only, instead of real-time transmission

POINT 3

A good solution showcase to evade us from device cost competition

03

Showcase #3: Standalone Voice Trigger

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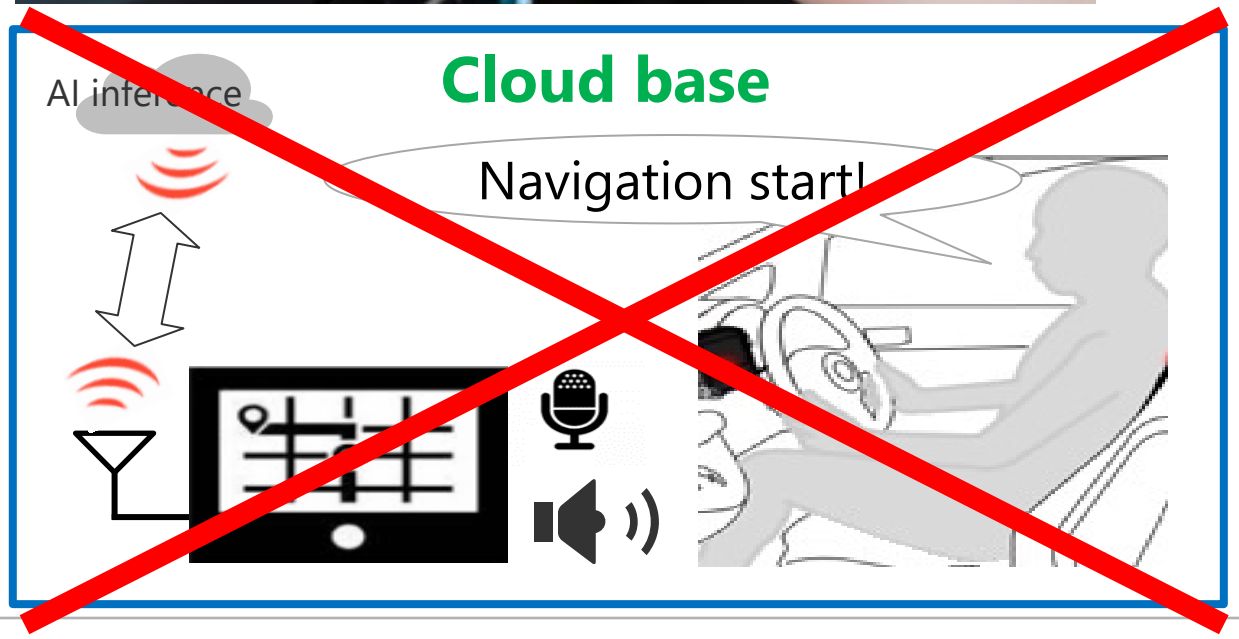
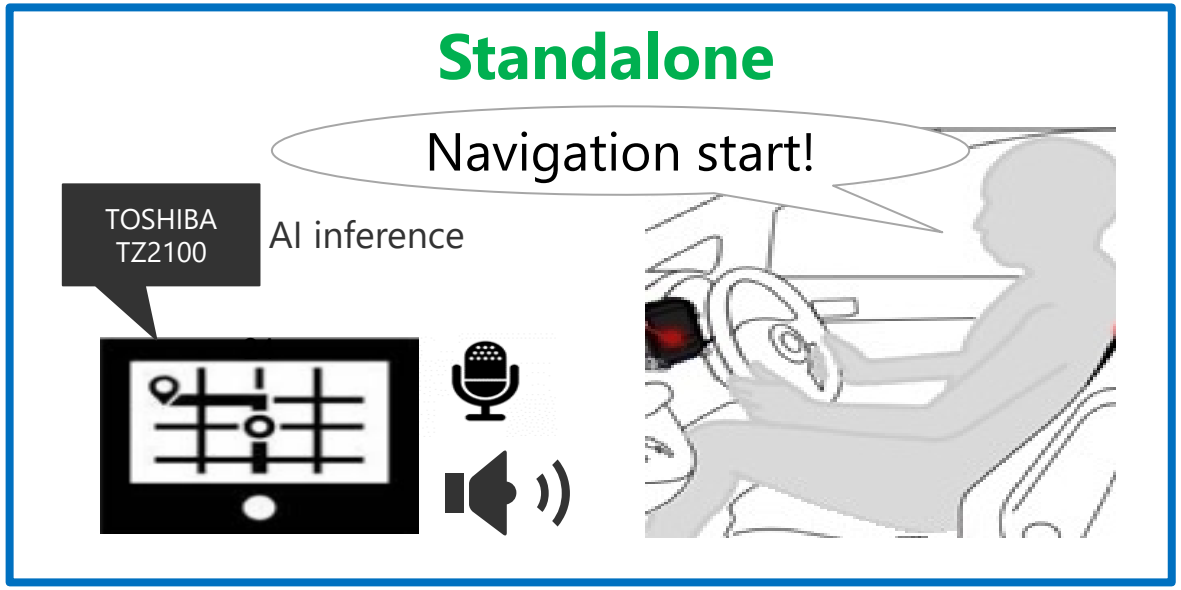
Standalone Voice Trigger

Voice-trigger is a safer HMI than touch-panel for in-car application.

Standalone voice trigger is a quicker, less running cost solution than cloud based voice trigger.





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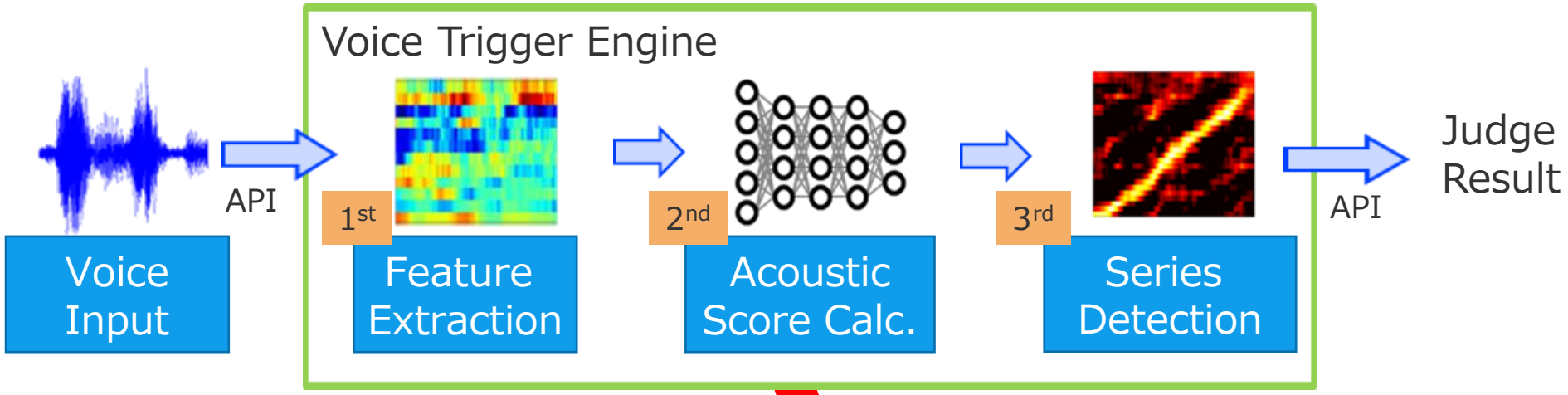
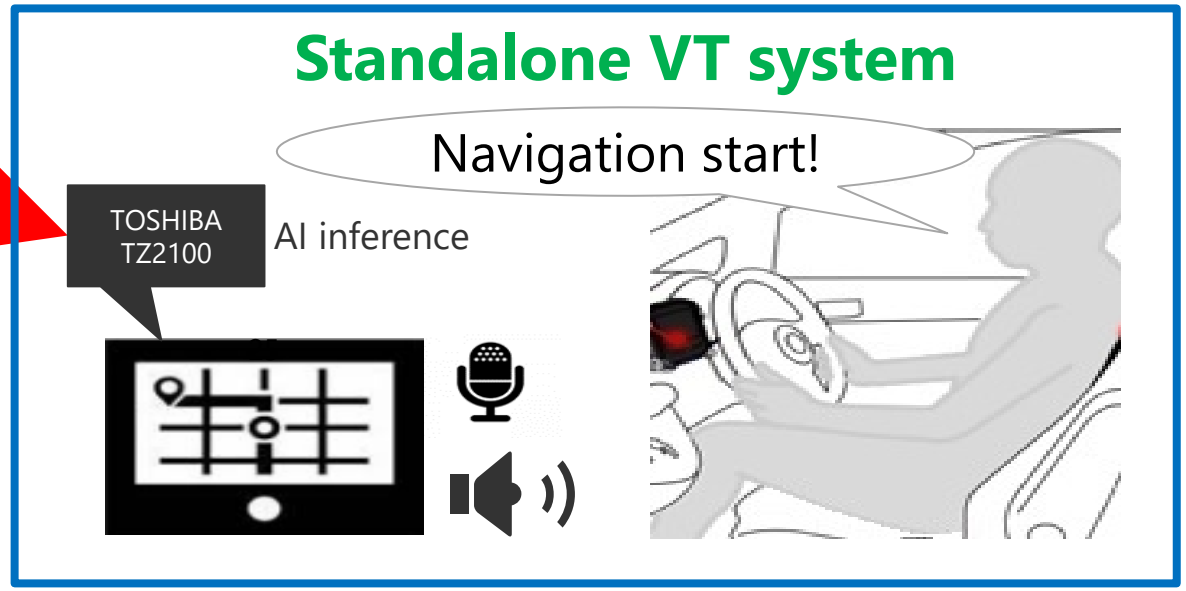
Standalone Voice Trigger



Voice Model

Command Dictionary



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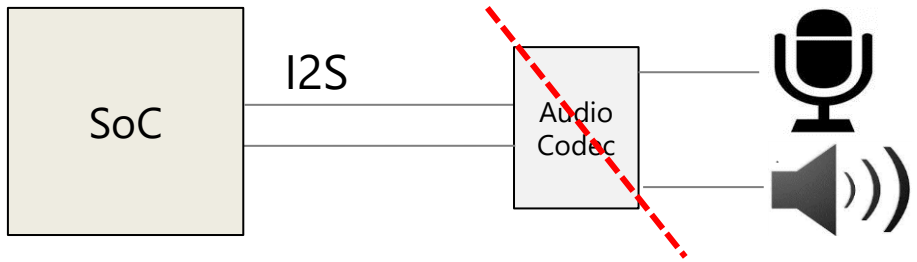
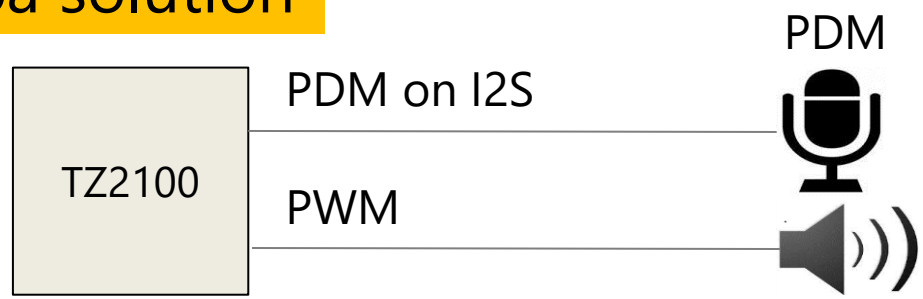
No Audio Codec hardware required

Competitors



Voice Input
Convert from PDM to PCM and detect the voice by MW on TZ2100

Toshiba solution



Voice Output
Output digital voice including AMP adjustment directly to speaker by MW on TZ2100

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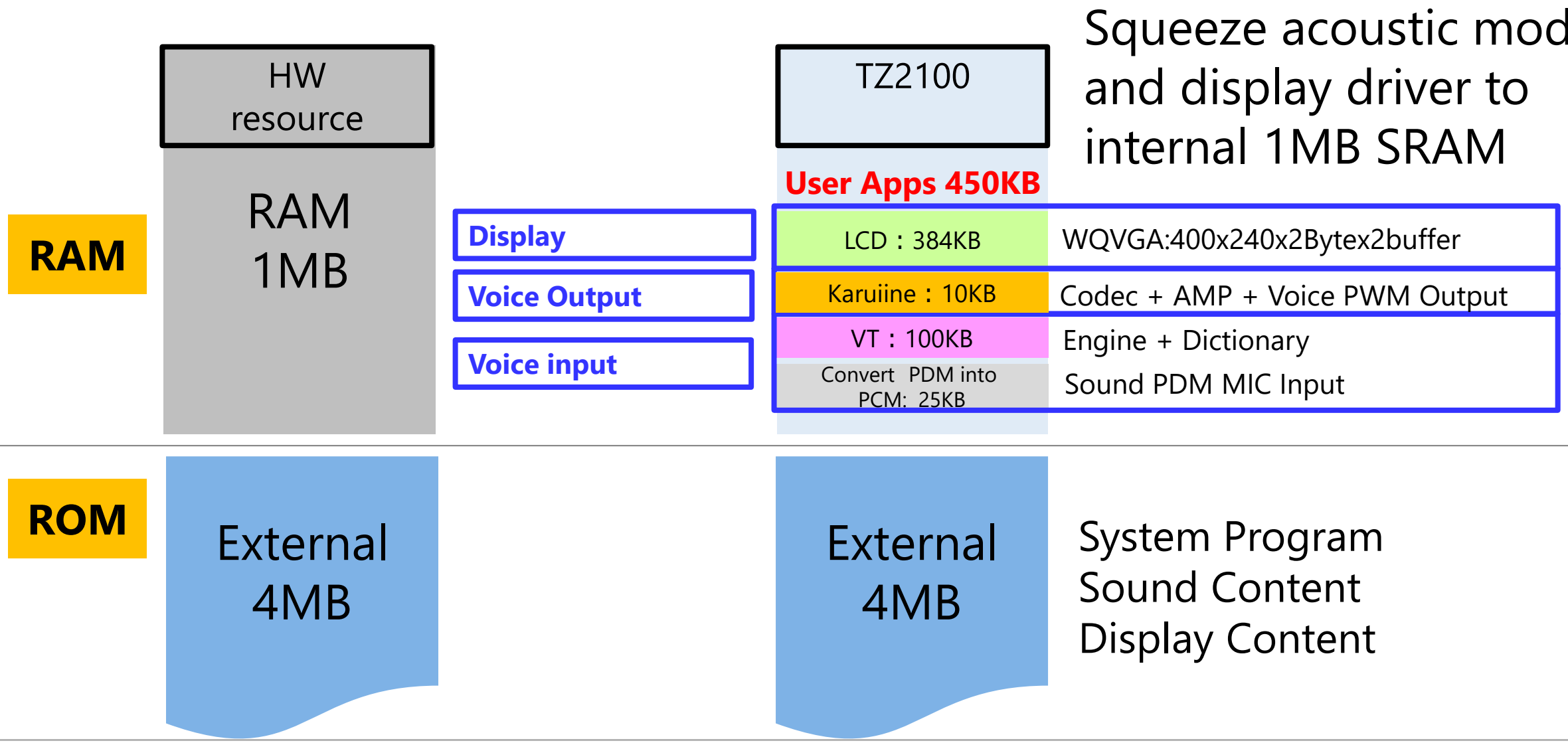
No external DRAM required



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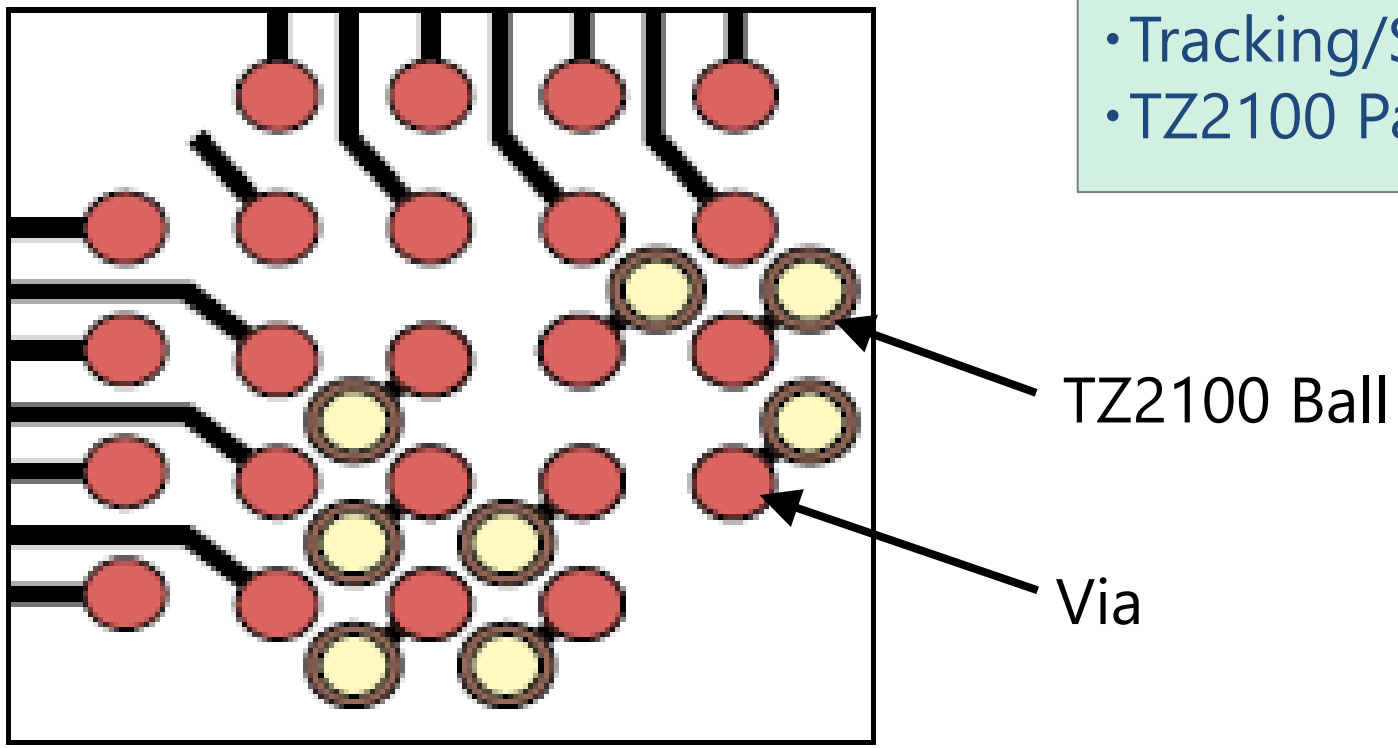
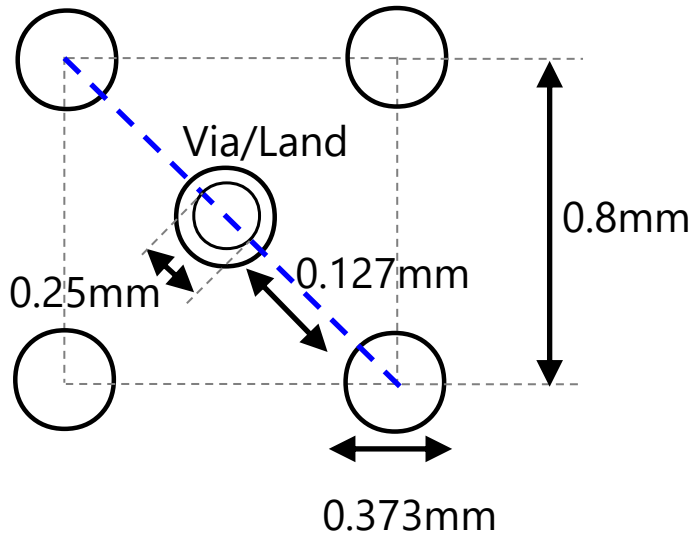
Manufacturable with 2-layer PCB

Layout Design Data Sample
(Around RGB signal)



＜Design Rule＞
- Min hole size: 0.25mm
- Tracking/Spacing (L/S) = 0.127/0.127mm
- TZ2100 Pad size 0.373mm

TZ2100 BGA Pad



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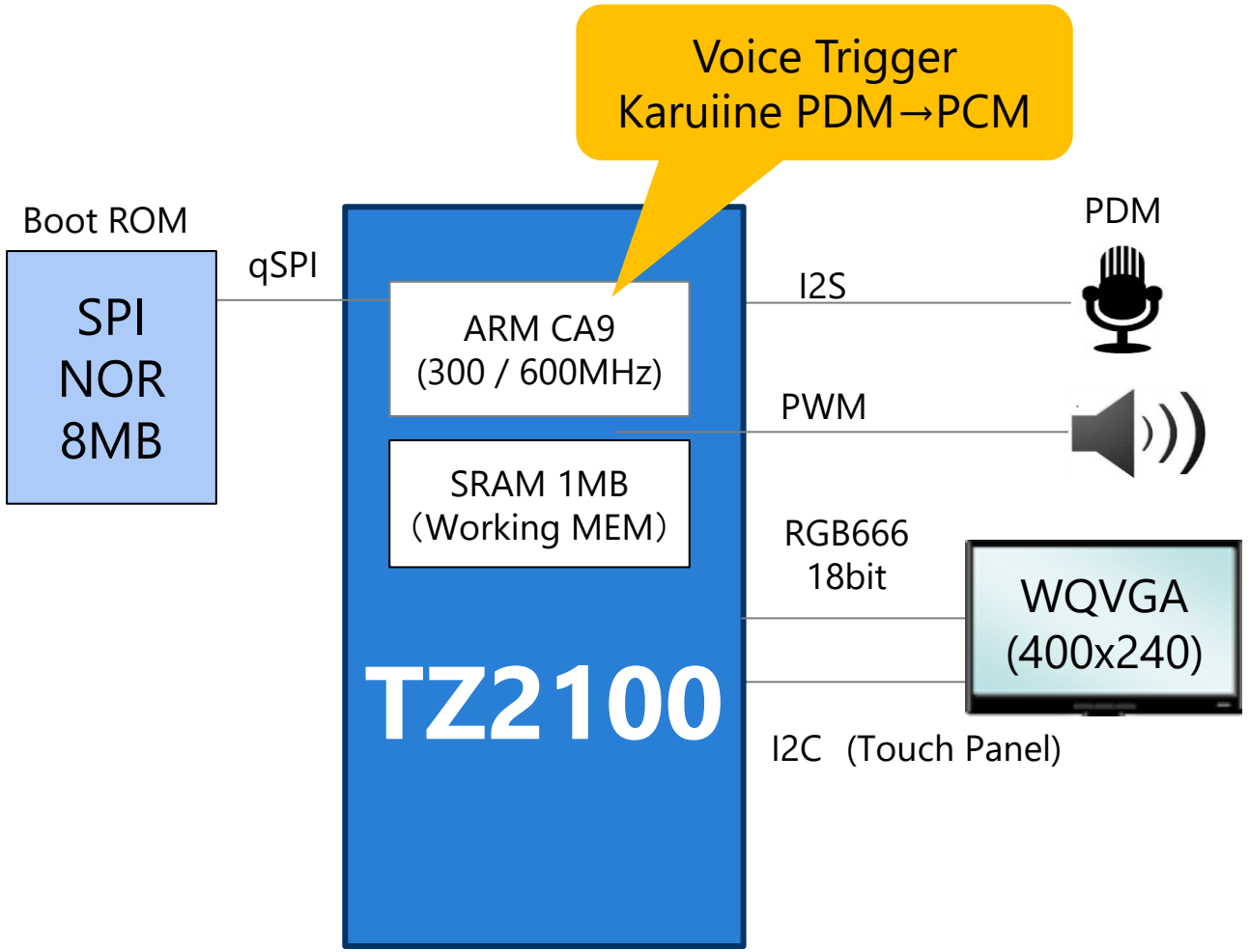
System BOM Cost Reduction



①Non DRAM — **$1.5**

Remove the external DRAM by embedded 1MB SRAM

②Non Audio Codec — **$1.0**

Remove the external Audio Codec by MW on TZ2100

③ 2 -Layer PCB — **$2.1**

Cut down from 6-Layer to 2-Layer PCBA （ $2.8→$0.7）

Total BOM Cost Down

$4.6

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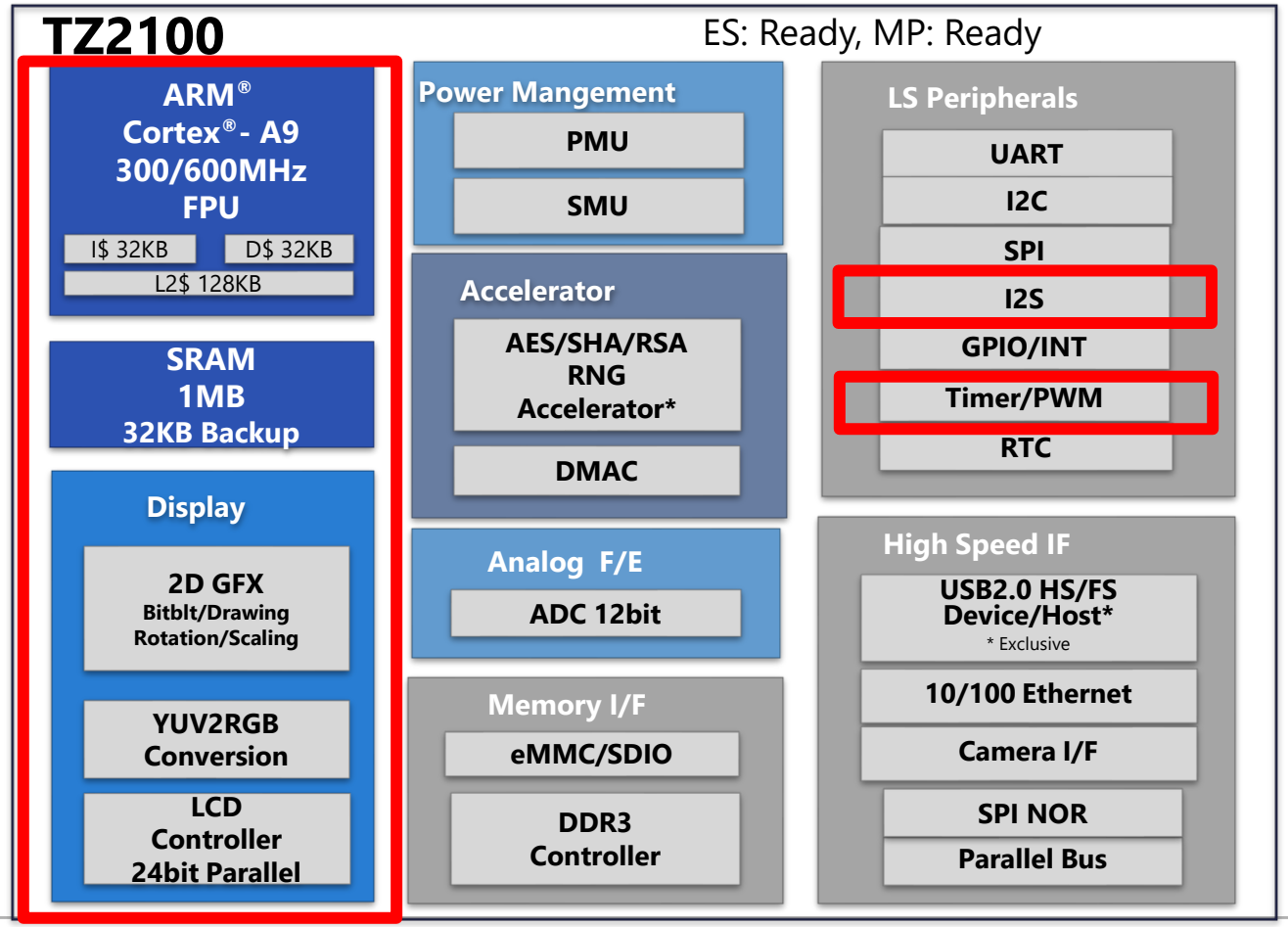
ARM®Cortex®-A9 TZ2100 Specification

- ✓TZ2100 has all key functions (Voice and Display) for HMI
- ✓Integrate 2D graphic engine supports compact display system
- ✓Provide module board for customer evaluation



Function	Description
CPU	ARM® Cortex®-A9 300/600MHz L1$ 32KB, L2$ 128KB, FPU
Internal RAM	SRAM 1MB + 32KB (Backup)
2D Graphic	Bitblt/Line･Triangle/Resize/Rotate
Analog	12bit ADC
Encryption Engine	AES/SHA2/RNG Encrypt/Decrypt Engine
Display I/F	24bit Parallel I/F (WVGA 60fps)
Peripheral I/F	(High Speed I/F) DDR3 800Mbps x16bit 8bit Parallel Camera I/F 10/100Mbps Ethernet Mac USB 2.0 HS/FS Host or Device eMMC/SDIO/SD Parallel Bus I/F (Low Speed I/F) I2S/UART/I2C/SPI/GPIO TIMER/WDT/PWM/RTC
Package	BGA310 (16x16, 0.8mm pitch)

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Hardware Deliverables

Part Number	Size	Parts on board	Supported I/F
RBTZ2100-1MA	150x130mm	TZ2102(300/600MHz), Power IC, DDR3L-800 256MByte, SPI Flash 16MByte, eMMC 4GByte, EEPROM 2Kbit, Audio Codec, Ether 10/100Base PHY, USB to PHY switch	microSD card slot, LAN connector, UART for debugger (MicroUSB connector) USB Host / Device connector (exclusively), JTAG connector, Camera input connector(parallel) LCD panel connector , Mic jack, Headphone jack , I/F for expansion

Deliverables:

- TZ2100 Datasheet
- Evaluation Board
- Schematics
- Layout

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Software Deliverables

1. Drivers (BSP)

○ : ready □ : under planning

HW / SW	CPU		Power Management	Memory IF		Display			High speed I/F					Low speed peripherals									AFE	Accelerator	
	L1$	L2$	PMU/SMU Power mode control	DDR3	eMMC/SDIO	LCDC	YUV2RGBC	2D GFX	USB host	USB device	10/100Ether	Camera I/F	SPI NOR	UART	I2C	SPI	I2S	GPIO	PWM	Timer	RTC	INT	ADC	DMAC	AES/SHA/RSA RNG
Linux (3.10.31)	○	○	○	○	○	○	○	○	○	○※1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○※2
NonOS	○	—	○	○	○※3	○※4	○※4	□	□	□	□	○※4	○※3	○	○	○	○	○	○	○	○	○	○	○	□

2. Middleware (SDK)

Graphic (Linux: OpenVG, Non OS: SDL)
Voice Trigger
Karuiine
ToSpeak

【Notes】
※1 support mass storage mode
※2 Optional Function
※3 Only Support Booting from eMMC/SD/SPI
※4 Only Support YUY2 input, RGBA888 output

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Standalone Voice Trigger

POINT 1

A new UI to replace touch panel and remote-controller

POINT 2

Extremely low latency of voice recognition without going through cloud

POINT 3

Module business including acoustic model training service by Toshiba

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