MSX 0 for <u>IoT(Internet of Things</u>) MSX 3 for <u>hobby & education</u> MSX turbo for <u>personal supercomputing</u>

"Applying FPGA to the next generation of Computing"

DevCon 2 Spain

Barcelona

January 28, 2023

Dr. Kazuhiko Nishi

To all of you

- Thank you for your support for MSX over the last 40 years.
 - You have prolonged the life of MSX for these years.
- At age 60, I thought what should I do before I die.
 - I decided to go back to engineering again.
- Launched the University of Tokyo IoT Media Laboratory
 - Teaching, research and development on the projects of IoT
- Age 65 is retirement age from university.
 - Established NPO and Research continues. Lab members also joined.
- I want to create a new generation MSXs for the 40th anniversary of MSX.
 - Something completely new, but with software compatibility.

Purpose of DEVCON

- A computer without software is not a computer
- I want to apply the technological advances in hardware and software over the last 30 years
- Those who make hardware want to hear the wishes of those who make software and those who use it.
- I want to hear their voices directly.
- I want to enjoy and value not only the final product but also the process of making it

DEVCON Schedule

- Japan:
 - Tokyo, Osaka, Nagoya, Sapporo, Fukuoka, Sendai, Hiroshima
- Overseas:
 - Spain, Netherlands, Italy, Brazil
- Worldwide:
 - via internet zoom

What was the essence of MSX?

- Plug-and-play with ROM cartridges
- MSX BASIC
- GML、MML
- •MSX V9938/58 VIDEO
- 8bit Z80 products under MS-DOS•Windows

3rd generation 3 areas: IoT, MSX, Supercomputer

- What is IoT? What's next after LED blinking, temperature, humidity?
- What is MSX ---Fun, educational, introductory machine
- What is a supercomputer? You can see it, but you can't touch it... What do you do with it?
- We will never understand computers and smartphones.
- And we never figure out the game console.
 - It's the next three types: X, P, S
- Hardware we will never touch
- Stop hardware, we'll all be programmers!!!!!!!



- Using Emulater
 - MSX OS
 - MSX, MSX2, MSX2+
 - BASIC interpreter, compiler
- Download BASIC binaries in remote environment situations and remote control
- Export remotely from BASIC to the cloud





MSX OS by Néstor and Tools

MSX BASICi, MSX BASICc

- Clock: 700MHz 200 times
- CPU is R800 10 times
- BASICc 10 times

Totally 20,000 times fast

Seeed Grove Sensor

Grove Beginner Kit (10pcs)

MSX 0 Cartridge Octopus – all MSX will be MSX0

System diagram of MSX 0 Octopus

MSX 0 Zero

MSX3 System Developer's Kit

• MSX engine 3 and other MSXM + Motherboard light for MSX 3 engine

Pi-size **MSX** 100bus **Module** (MSXM)

- Same size as Raspberry Pi
- Two holes same positions and Two holes other positions
 - MSX engine 3
 - MSX engine 6
 - MSX video engine
 - MSX audio engine

50 pin Cartridge

- USB Cartridge
- Grove Cartridge

60 Pin Cartridge

- MSX audio engine
- Same size as Synthesizer Module from YAMAHA

• MSX engine 3

Zyng 7000 series comparison table										
Device name	Type name	Price(USD)	System Logic Cell (K)	Block RAM (Mb)	DSP Slice					
Z-7010	XC7Z010-1CLG400C	75.32	28	2.1	80					
Z-7020	XC7Z020-1CLG484C	136.71	85	4.9	220					
Z-7030	XC7Z030-1FBG676C	289.90	125	9.3	400					
Z-7035	XC7Z035-1FBG676C	1082.40	275	17.6	900					
Z-7045	XC7Z045-1FFG676C	1732.90	350	19.1	900					
Z-7100	XC7Z100-2FFG1156I	3988.89	444	26.5	2020					

- MSX engine 3
- MSX engine 6

Ultrascale+ MPSoC comparison table								
Type name	Price (USD)	Evaluetion boards			Logic cell			
XCZU2CG-1SBVA484I	348.60				103K			
XCZU3CG-1SFVC784E	480.20				154K			
XCZU3EG-2UBVA530I	697.41	UltraZed-EG	Ultra96-V2		154K			
XCZU7EV-2FFVC1156I	4,737.96	ZCU104	ZCU106	UltraZed-EV	504K			
XCZU9EG-2FFVB1156E	5,181.40	ZCU102			599K			

MSX engine 3 + Raspberry Pi CM4 = MSX 3.14

- MSXM with MSX3 engine 3 and Stacking MSXM with Raspberry Pi CM4
- •2 x ARM32 + 4 x ARM64 + Pi GPGPU
- Pi software also runs
- •4K graphics

Support of ORIN NANO, ORIN NX,

- Recommend using Open GLes
- Graphics
 - 9998 2k
 - 9999 4k
 - Pi GPU 4k
 - ORIN NANO GPU 4k
 - ORIN NX GPU 4k

GPGPU comparison table								
Board	Al Performance	Floating operation	Price(Yen)	the source of price				
Jetson Nano	* 0.47TFLOPS	0.5TFLOPS	112,146	RAKUTEN				
Jetson NX Xavier	* 6TFLOPS	10TFLOPS	228,000	Amazon - J				
JETSON AGX Orin 32GB	* 66TFLOPS	-	373,780	NTT - X store				
A100 80GB PCIe	** 19.5TFLOPS	312TFKOPS	2,447,830	PC4U Online shop				

* : FP16 ** : FP32

Linux

- All of lunguages runs on Linux
 - •Python
 - •Cython
 - •LISP
 - •C
 - •C++

Linux move to TAOX

TAOX VM64 emulator

- Developed by Chris Hinsley
- Long history
- Now working
 - Linux
 - 32 bit
 - 64 bit
 - Windows
 - MAC

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MSX 3 Cartridge

• MSX, MSX2, MSX2+, MSXTR upgrade to MSX3 when plugged in

1chip MSX3 from D4E

MSX3 Cube under developing

MSX3 notebook under developing

MSX3 pocket in developing by a company in Kyoto

MSX3 KB Pro under developing

MSX3 KB Light under developing

Hand Held MSX3 TBD

MSX turbo

- MSX turboA8
- MSX turboA16
- MSX turboX128
- MSX turboM256
- •MSX turboS4096
- MSX plugin card for desktop tower

MSX turbo desktop Tower

4U MSX 200bus Plug in Card

- •4U height
- •x4 MSXM
- 19inch Rack-size compliant
- •18 sheets
- •16 in Tower Rack

FORTRAN / MPI, Occam3

- FORTRAN for 32 bit ARM
- We are going to use parallel compiler OCCAM2 for MSX3, which have been used for Transputer

MSX turbo A8/A16 Xilinx ARM64bit

MSX turbo X 512 XMOS 32bit

MSX turbo M 1024 32bit MPPA VLIW

MSX turbo S 4096

MSX turbo N128 Threadripper PRO

Your comments and wishes are highly welcome.