Operating Systems

On-line, NTUCOOL

薛智文

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https://ceiba.ntu.edu.tw/1082CSIE3310_OS

2020 Spring

The Cone of Learning

sparkinsight.com

I see and I forget.
I hear and I remem
I do and I understand.
— Confucius

荀子《儒效篇》：「不聞不若聞之，聞之不若見之，見之不若知之，知之不若行之；學至于行之而止矣。」

靈感
腦補

After 2 weeks,
we t d to remember ...

- D
- e SEE
- of what
  EE & HEAR
- 0% of what we SAY
- 90% of what we SAY & DO

Verbal receiving

visual receiving

participating

Passive

Active

Source: Edgar Dale (1969)

比較 Teams 方案

	免費 (無履約承諾) Microsoft Teams (免費) 免費註冊	NT$150.00 每個使用者/每個月 (年度履約承諾) 價格不含營業稅。 Office 365 商務基本版 立即購買 深入了解 >	NT$375.00 每個使用者/每個月 (年度履約承諾) 價格不含營業稅。 Office 365 商務進階版 立即購買 深入了解 >
✓ 部分包含　✓ 包含			
聊天與共同作業	✓	✓	✓
包含 Microsoft Teams	✓	✓	✓
使用者人數上限	✓ 300	✓ 300	✓ 無限制
Teams 無限制的聊天訊息和搜尋	✓	✓	✓
來賓存取 Teams	✓	✓	✓
聊天中的檔案附加功能	✓ 每個使用者 2 GB	✓ 每個使用者 1 TB[1]	✓ 無限制[1]
在團隊和頻道中共用檔案	✓ 整個團隊 10 GB	✓ 每個組織 1 TB，外加每個授權 10 GB[2]	✓ 每個組織 1 TB，外加每個授權 10 GB[2]

市值 2015/03/02

Application Software	System Software	Hardware
訊連 5x	系微 1x (18.2 億台幣)	台積電 2120x5.15
趨勢 82x		鴻海 707x1.72
PC Home 17x		聯發科 411x1.00
宏達電 華碩 廣達 68x 132x 169x		
Adobe 681x	Citrix 176x0.43	Intel 2720x6.61
Semantec 297x	Vmware 628x1.53	TI 1063x2.59
Microsoft 6213x15.10		ARM 432x1.05
Google 6564x15.96		QCOM 2066x5.02
Facebook 3835x		
Alibaba 3662x	IBM 2764x 6.72	
	Apple 12922x31.41	

市值 2016/03/01

Application Software	System Software	Hardware
訊連 8x	系微 1x (9.28 億台幣)	台積電 4163x10.42
趨勢 187x		鴻海 1314x3.29
PC Home 38x		聯發科 400x1.00
宏達電 華碩 廣達 72x 219x 234x		
Adobe 1519x	Citrix 389x0.97	Intel 5003x12.52
Semantec 451x	Vmware 763x1.91	TI 1919x4.80
Microsoft 14404x36.04		ARM 687x1.72
Google 17190x43.01		QCOM 2718x6.80
Facebook 10892x		
Alibaba 6024x	IBM 4530x11.34	
	Apple 19188x48.01	

百分數	等第	定義
90-100(95)	A+	**All goals achieved beyond expectation** 所有目標皆達成且超越期望
85-89(87)	A	**All goals achieved** 所有目標皆達成
80-84(82)	A-	**All goals achieved, but need some polish** 所有目標皆達成，但需一些精進
77-79(78)	B+	**Some goals well achieved** 達成部分目標，且品質佳
73-76(75)	B	**Some goals adequately achieved** 達成部分目標，但品質普通
70-72(71)	B-	**Some goals achieved with minor flaws** 達成部分目標，但有些缺失
67-69(68)	C+	**Minimum goals achieved** 達成最低目標
63-66(65)	C	**Minimum goals achieved with minor flaws** 達成最低目標，但有些缺失
60-62(61)	C-	**Minimum goals achieved with major flaws** 達成最低目標但有重大缺失
<59(含)	**F**	**No goals achieved** 所有目標皆未達成

Course Expectation

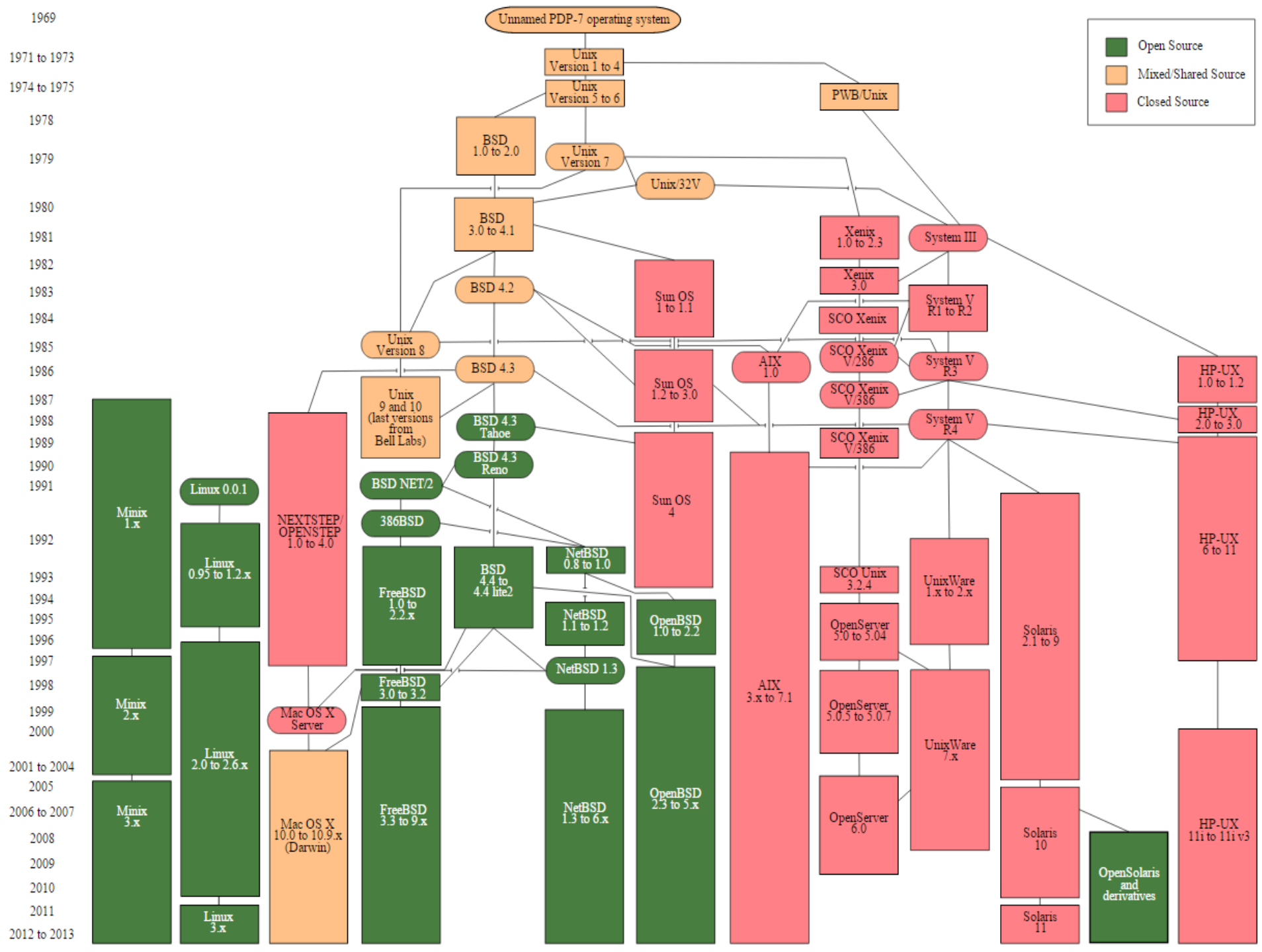
- Understand the OS concepts
  - Why and how you study OS?
  - Quick but no rush, get your hands dirty!
- Participation
  - Ask and answer questions
  - Do not skip the recordings unless …
- Team Work, Peer Appraisal
- No Cheating
- Software Engineering
- Turn in projects in time (minimum)
- Check your final scores

NOTE that in the question, it is intended to provide redundant or miss certain assumption to disguise you. Please make your own assumption if necessary to answer the questions.

- (25 points) On Singles Day (光棍節), millions of on-line shopping transactions are processed in a very short period of time. The supply of each product is limited. We need to make sure there is enough supply for each commit transaction and processing should be as soon as possible.

a) (5 points) What kind of transaction scheduling algorithm can generate the most revenue for the shopping service provider (such as PCHome)
b) (5 points) How do we guarantee that the earlier transaction is the earlier processed? Hint: The earlier sent or arrived? There is no global clock.
c) (5 points) If we would concurrently process the transactions in a distributed manner, how to synchronize so that the products are not over sold while the process time is minimized as possible.
d) (5 points) The transactions might be cancelled by users for any reason or by the system because there is no enough supply. How do we design the file system to store transactions so that it is both trustful and efficient?
e) (5 points) What attacks need to be handled at this high-speed transaction? How?

- (20 points) For each of the following statements, answer **True/False** followed by the number with the closest reason in the providing reason list or **write your own brief reason.**
  1. [2 points] The more threading, the more performance.
  2. [2 points] The more frames, the less page fault rates.
  3. [2 points] The bigger time quantum, the less average turnaround time.
  4. [2 points] Multiprocessor system increases throughput.
  5. [2 points] Firmware can be executed faster in RAM.
  6. [2 points] Modularity is one of the reasons to support process cooperation.
  7. [2 points] A safe state is not a deadlocked state.
  8. [2 points] UNIX Semantics: Writes to an open file by a user are visible immediately to other users who have this file open.
  9. [2 points] A real-time scheduler schedules tasks according to their priority in a fastest manner.
  10. [2 points] The two-phase locking protocol ensures conflict serializability and prevents deadlock.
- Reason List
  1. It depends on the number of processors.
  2. It might have thrashing.
  3. Because of Belady's anomaly
- Sample Answer
  1. False, 2.
  2. False, 因為畢雷地反常
  3. False, 3.

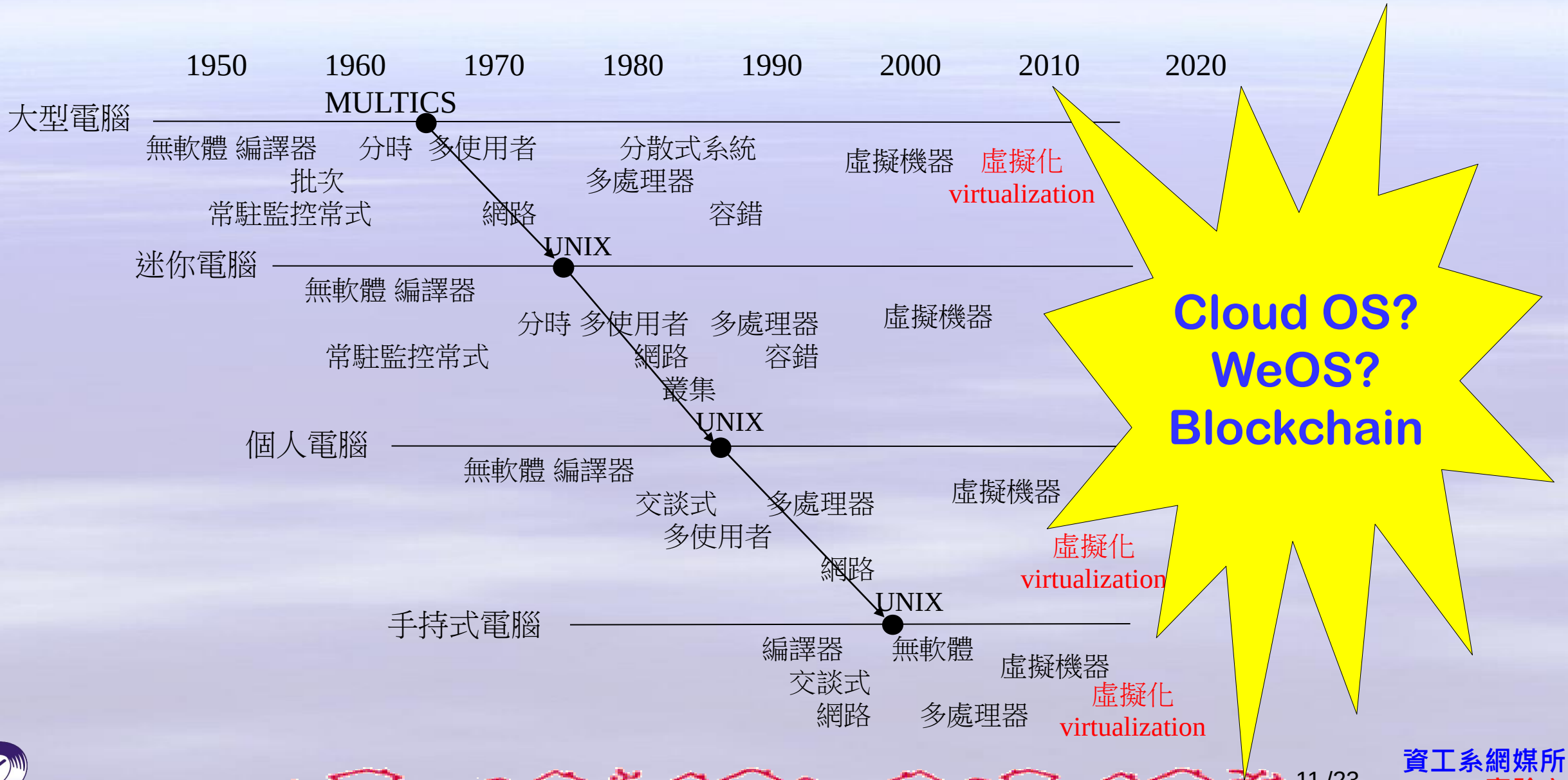


RTOS at a Glance

- http://www.onesmartclick.com/rtos/rtos.html

- AMX, KwikNet, KwikPeg *(from KADAK Products Ltd.)*
- C EXECUTIVE *(from JMI Software Systems, Inc.)*
- CMX-RTX *(from CMX Systems, Inc.)*
- DeltaOS *(from CoreTek Systems, Inc.)*
- eCos *(from Red Hat, Inc.)*
- embOS *(from SEGGER Microcontroller Systeme GmbH)*
- eRTOS *(from JK microsystems, Inc.)*
- ETS *(from VenturCom)*
- EYRX *(from Eyring Corporation)*
- INTEGRITY *(from Green Hills Software, Inc.)*
- INtime® real time extension to Windows® *(from TenAsys Corporation)*
- IRIX *(from SGI)*
- iRMX *(from TenAsys Corporation)*
- Jbed *(from esmertec, inc.)*
- LynxOS *(from LynuxWorks)*
- MQX *(from Precise Software Technologies Inc)*
- Nucleus PLUS *(AcceleratedTechnology, ESD Mentor Graphics)*
- On Time RTOS-32 *(from On Time Informatik GmbH)*
- OS-9 *(from Microware Systems Corporation)*
- OSE *(from OSE Systems)*
- PDOS (from Eyring Corporation)
- PSX (from JMI Software Systems, Inc.)
- QNX Neutrino (from QNX Software Systems Ltd.)
- QNX4 (from QNX Software Systems Ltd.)
- REDICE-Linux (from REDSonic, Inc.)
- RTLinux (from Finite State Machine Labs, Inc.)
- RTX 5.0 (from VenturCom)
- Portos (from Rabih Chrabieh)
- smx (Micro Digital, Inc.)
- SuperTask! (from US Software)
- ThreadX (from Express Logic, Inc.)
- Treck MicroC/OS-II (from Elmic Systems USA, Inc.)
- TronTask! (from US Software)
- TTPos: (from TTTech Computertechnik AG)
- VxWorks 5.4 (from Wind River)
- SCORE, DACS and TADS (from DDC-I)
- Nimble - the SoC RTOS (from Eddy Solutions)
- Nucleus (from Accelerated Technology)
- Fusion RTOS (from DSP OS, Inc.)
- FreeRTOS (from Richard Barry)

作業系統特徵遷移示意圖



OS Sizes

Linux	image	files	directories	lines	bytes
2.6.4	1150K	13400	960	5.6M	167M
2.4.25	1177K	11000	670	5M	149M
2.2.26	507K	5100	280	2.5M	75M
ThreadX	129K	158	1	29K	1.5M
uC/OS-II	55K	13	1	5.5K	0.4M
Tinix'	0.5K	1	1	20	0.5K

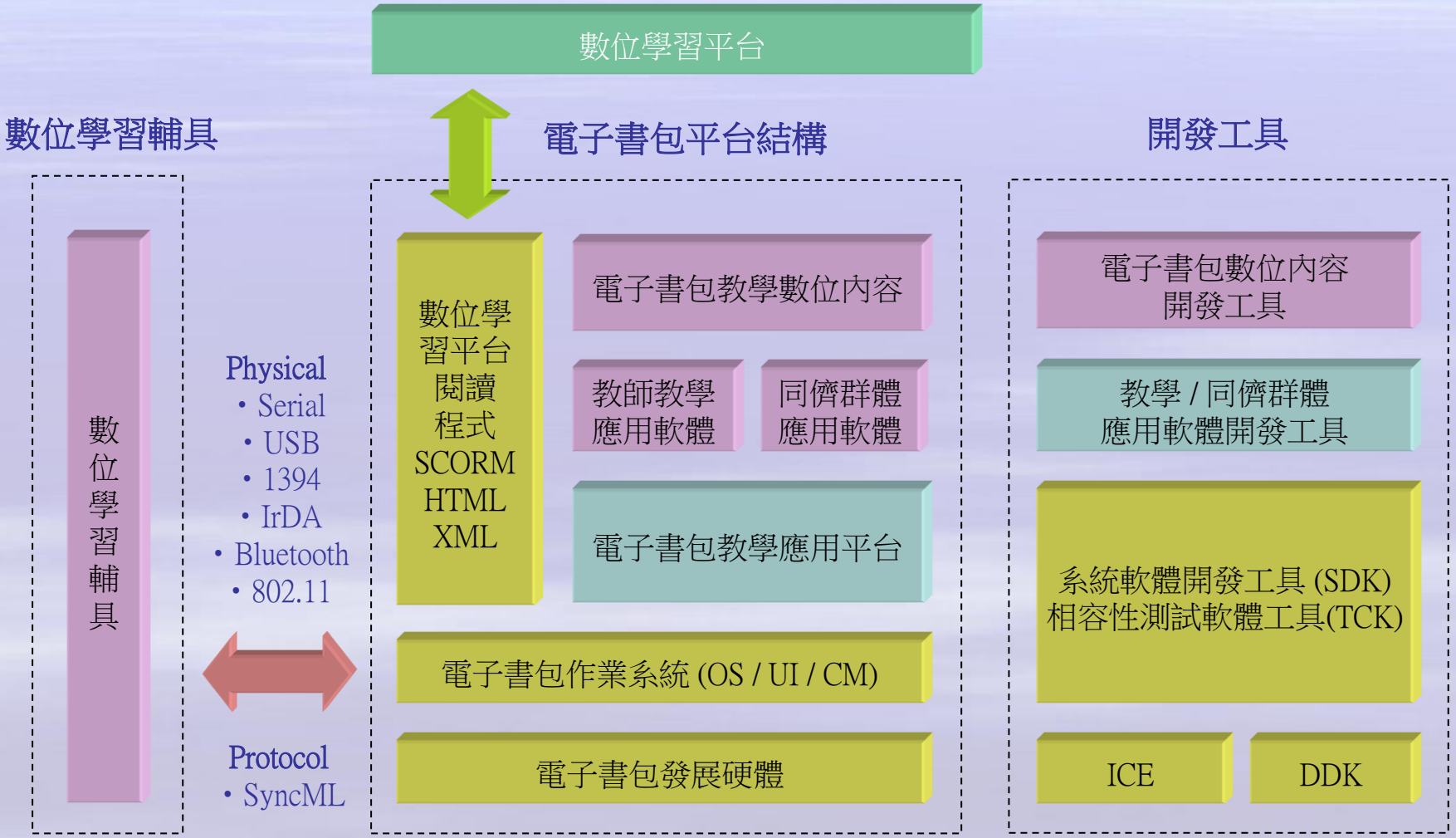
- Window 2000, 30M lines.
- Netscape Communicator 5, 17M lines.
- A GO (圍棋) program, 0.01M lines.
- A SOHO router, 0.6M lines.
- What is Embedded (OS/system)?

Tinix’

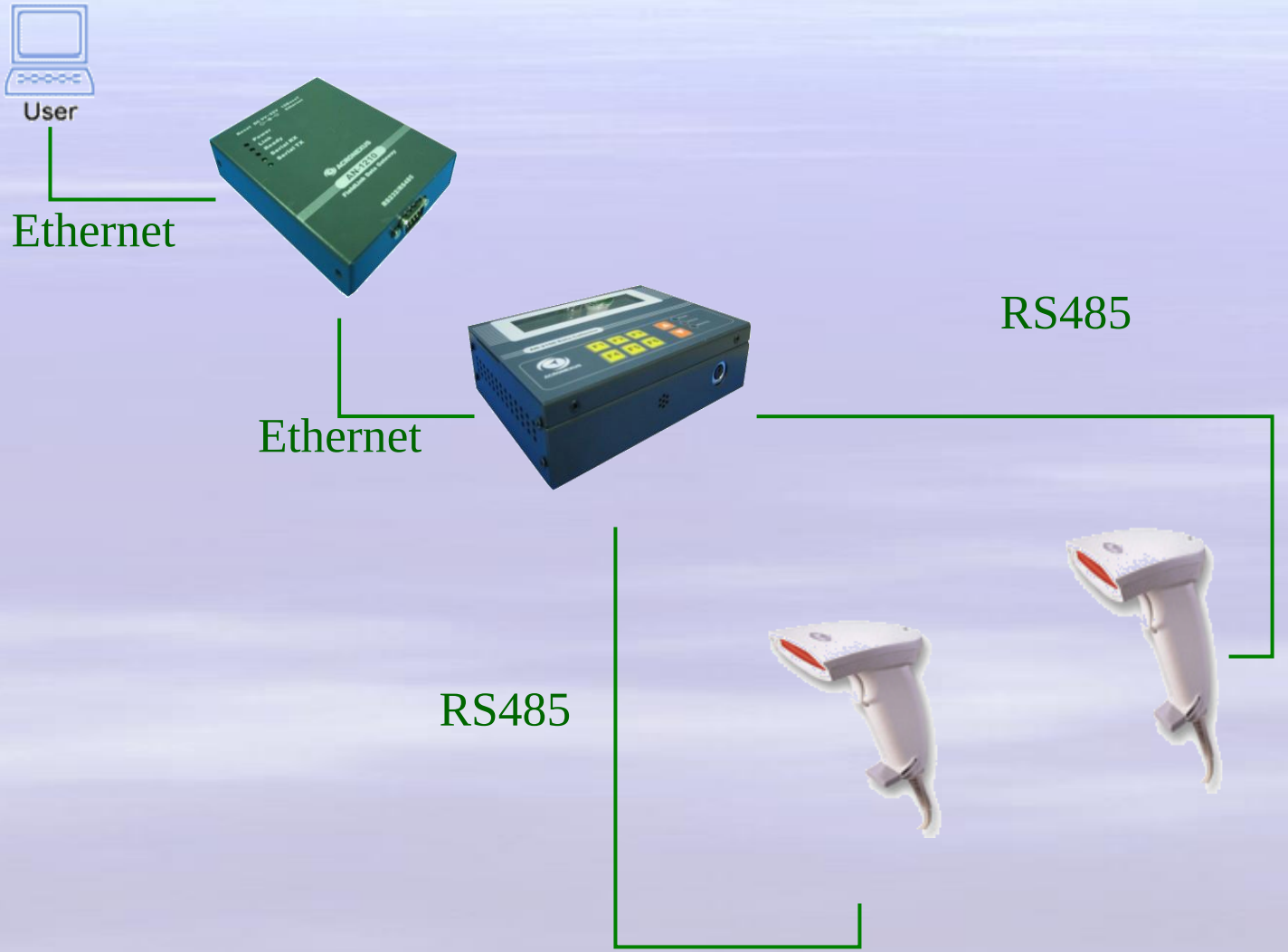
- “自己動手寫作業系統,” 于淵

```
org 07c00h                    ; tell the assembler to load onto 7c00, 0100h for DOS
   mov ax, cs
   mov ds, ax
   mov es, ax
   call    DispStr            ; call string display procedure
   jmp $                      ; infinite loop
DispStr:
   mov ax, BootMessage
   mov bp, ax                 ; ES:BP = string address
   mov cx, 16                 ; CX = string length
   mov ax, 01301h             ; AH = 13,  AL = 01h
   mov bx, 000ch              ; page number is 0 (BH = 0) black background red character
                              ; (BL = 0Ch, highlight)
   mov dl, 0
   int 10h                    ; the 10h software interrupt
   ret
BootMessage:       db       "Hello, OS world!"
times   510-($-$$)   db  0   ; fill the rest of sector (512 bytes) with 0
dw  0xaa55                    ; end of sector
```

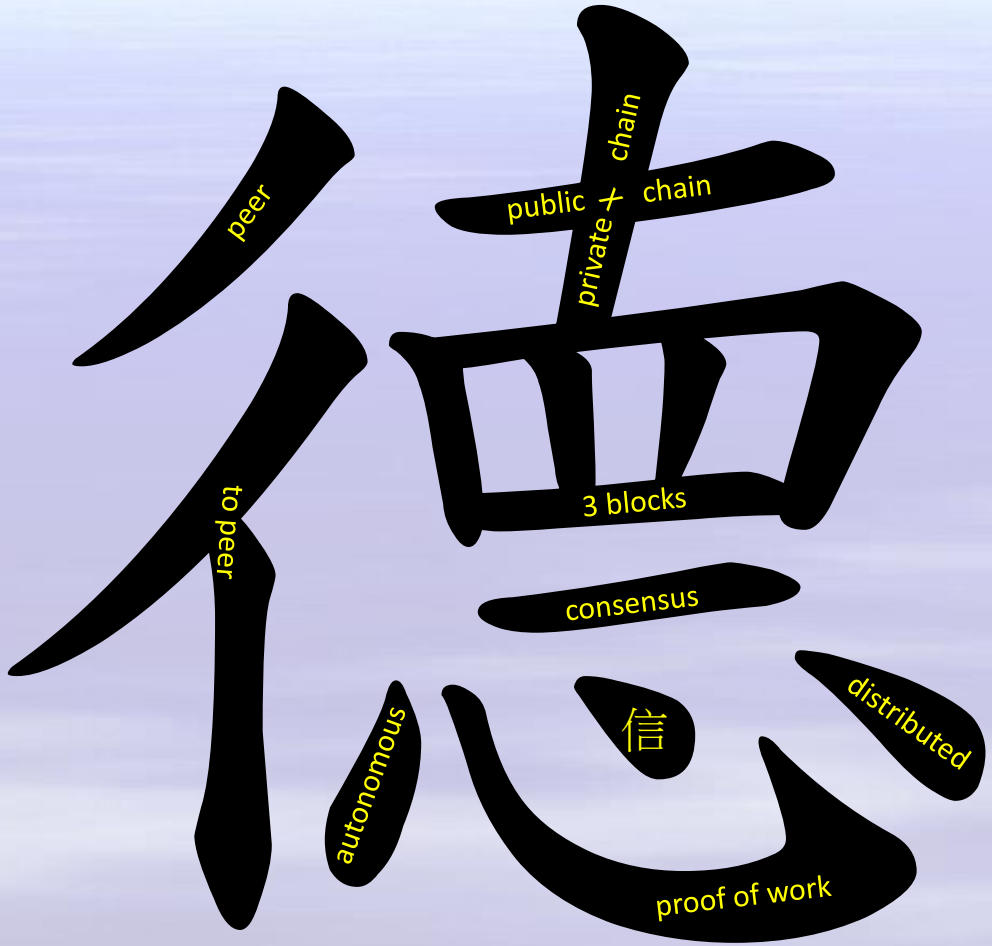
電子書包與數位學習輔具分工架構圖



Case Study

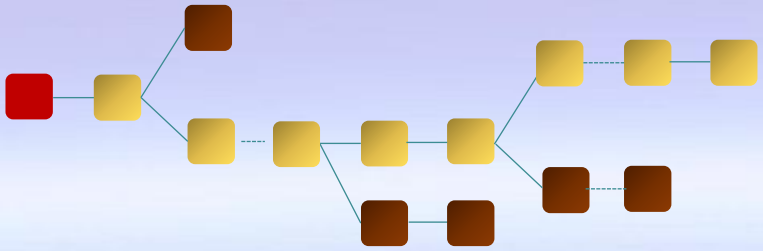


老子38章—
上德不德
是以有德 …
故
失道而後德
失德而後仁
失仁而後義
失義而後禮
夫禮者
忠信之薄
而亂之首



金剛經—
一切
聖賢
皆以
無為法
而
有差別

… 忠孝仁愛
信義和平 …



BlockChain:

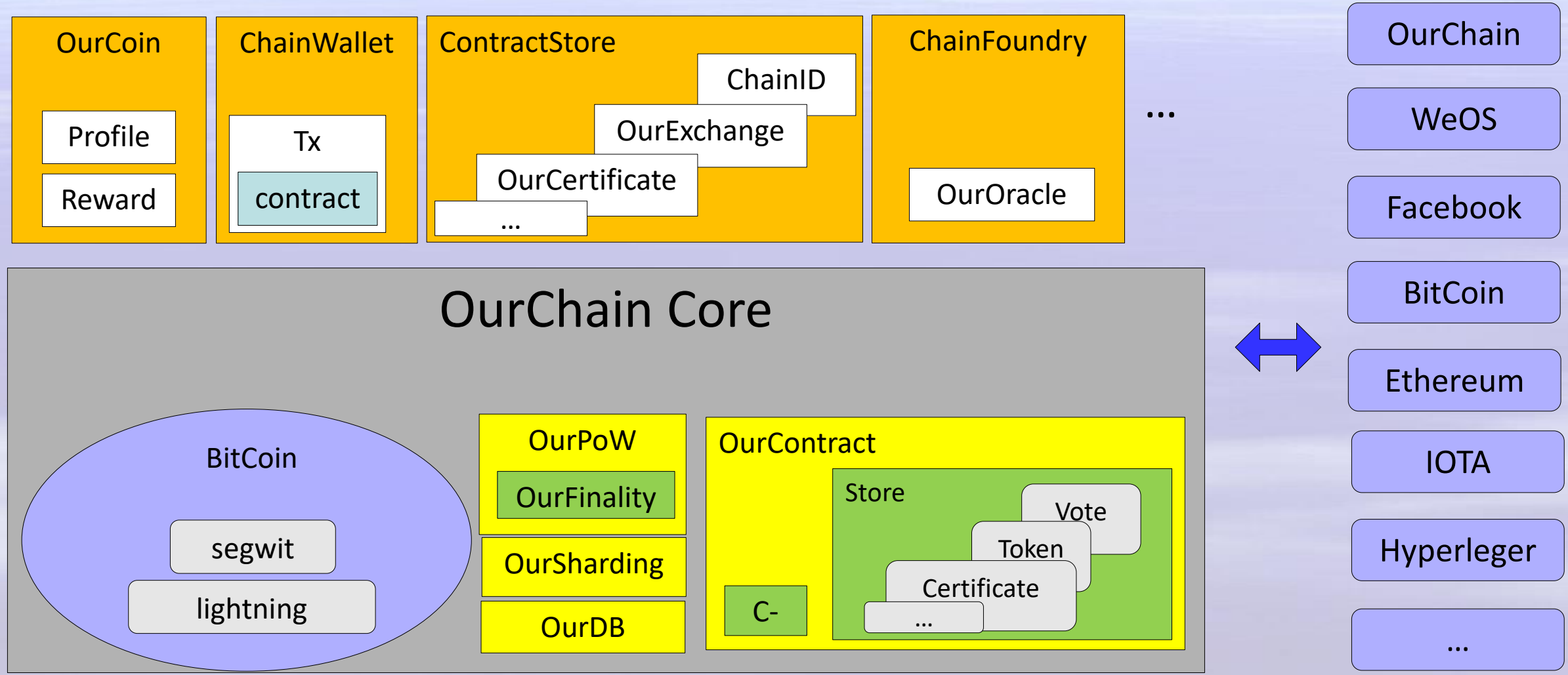
Trust

Any Computers

資訊(OS, AI), 網路,
密碼, 數學, 機率, 統計,
政治, **經濟**, 金融,
企管, 心理, 犯罪 ...
各行業專業知識
方興未艾

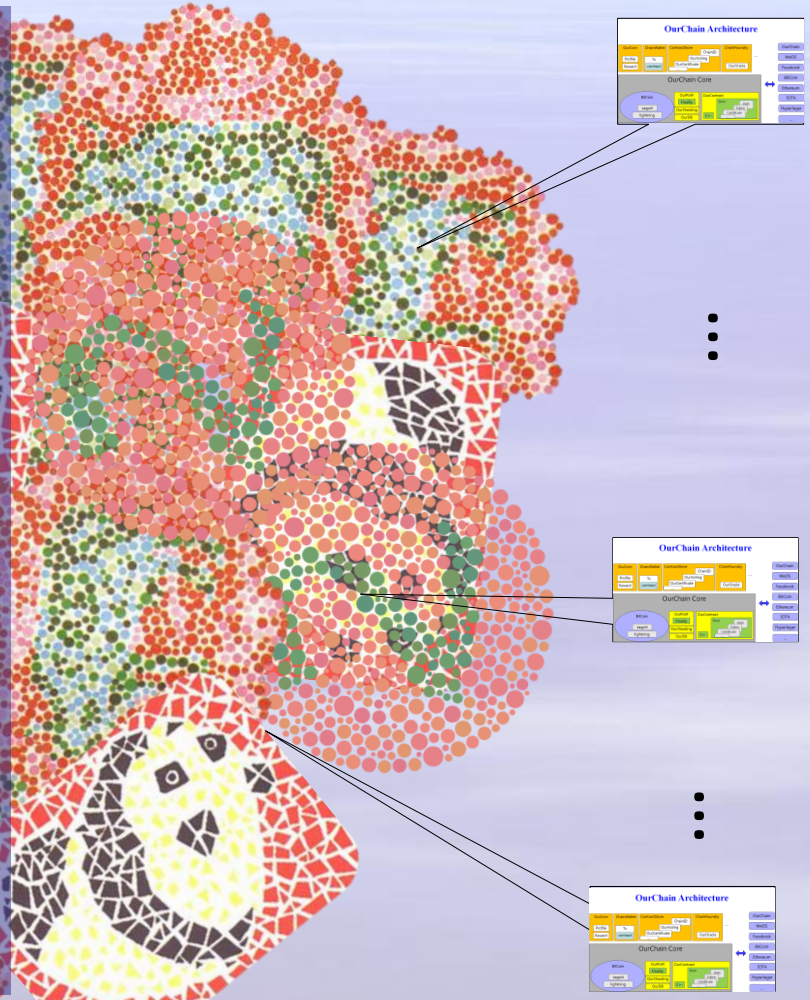
CSIE(OS, AI), Network,
Cryptography, Math,
Probability, Statistics, Politics,
Economics, finance,
MBA, Psychology,
Criminology ...
Domain Knowhows
Yet To Come

OurChain Architecture



三點成鏈 於公無限 公中有私 鏈鏈相連

以物易物
以幣易幣
交易自主
剝削壟斷
平台共享



Autonomous ID

Autonomous ID			
2	Default Index (for ad or image)		
0	_AID		
1	Selfie ID		
2	OpenID (Acer, Google, …)		
3	Chain ID		
4	Official ID / Mobile ID		
5	NTU ID, CAS		
…	~~Bank ID~~ (Sweden)		
11	1		
12	0	1	
13	3	1	
14	3	1	2
15	3	4	
16	5		
…			

_AID (Self certified authentication)	
ID	UUID
Hash	public key from password in local

Selfie ID (Self certified authentication)	
ID	Official ID
Photo	Selfie
Video	Selfie

Chain ID (How the ID is certified?)		
ID	BitCoin Address (Auto change later)	
ID System Index	Hash	Parameters

Official ID (Certified by Authorities)	
Country	Nationality/District
ID	Social Security/Passport

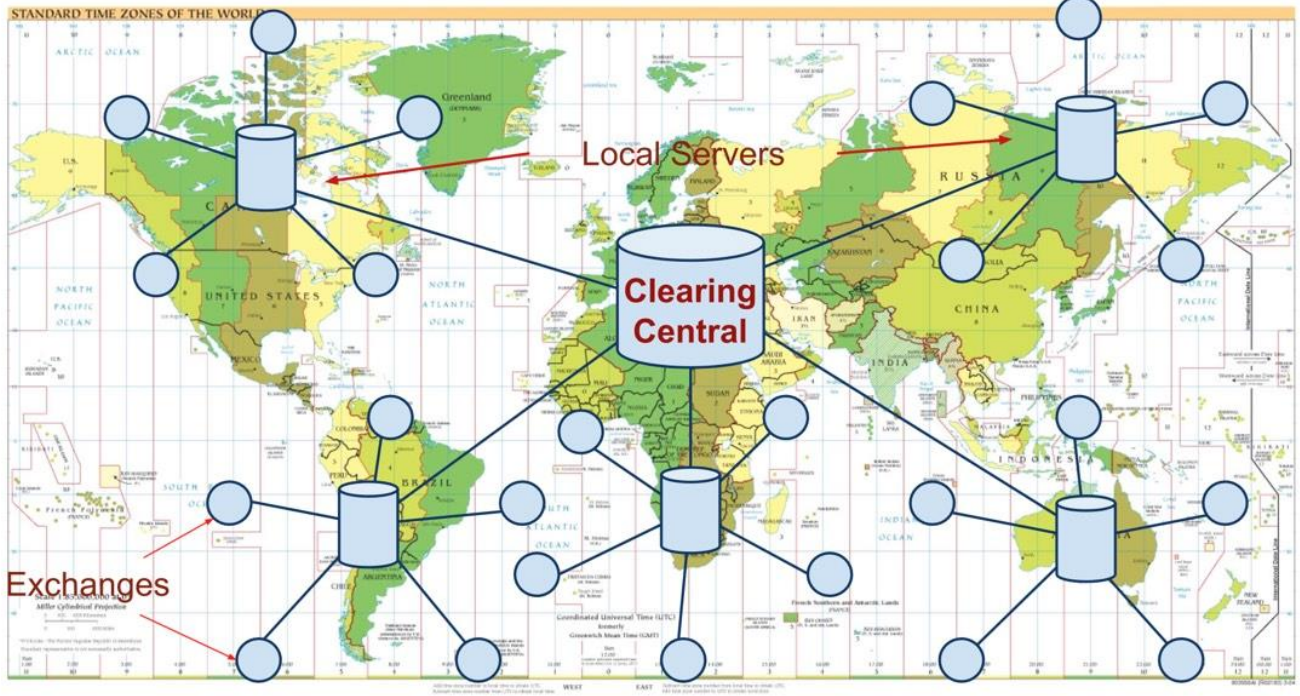
NTU ID	
Account	Password

www.community-exchange.org

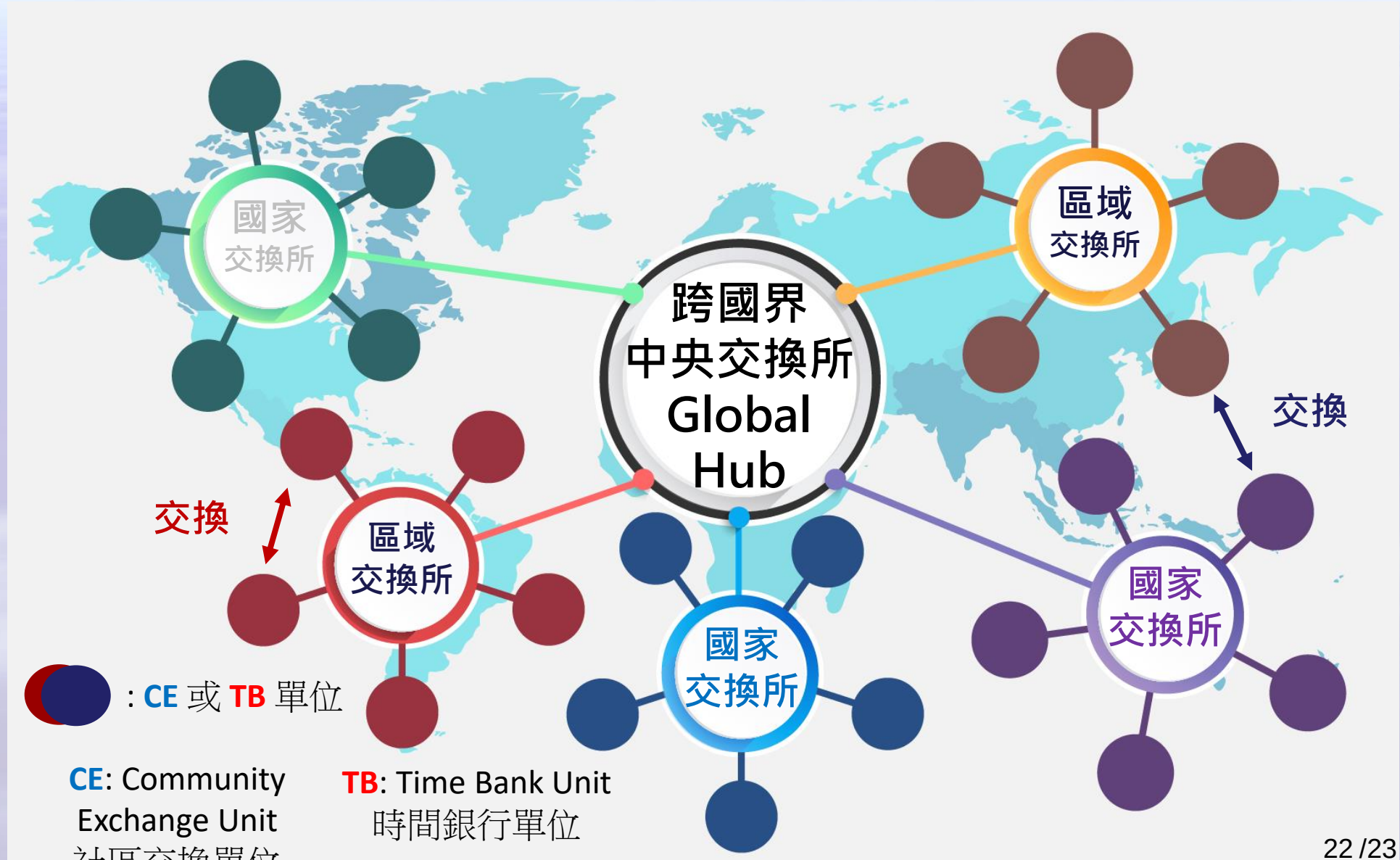
Structure of Community Exchange Network

Tim Jenkin

97 Countries, 1013 Communities (2003-2018 Oct)



TW Community Exchange System



Alternative Exchange System