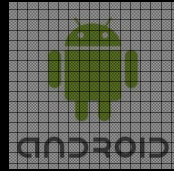


Operating Systems

Warning:
Acronym density approaches 1



Programming "Apps"



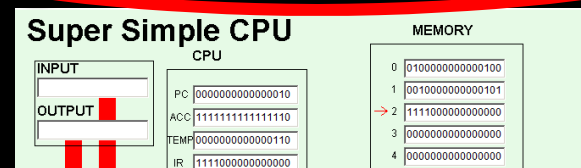
Programming Anything



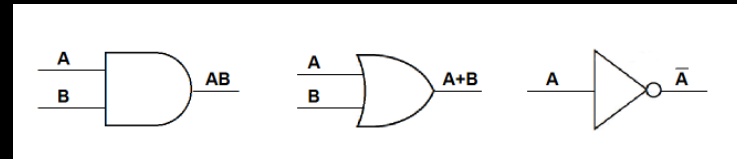
Operating Systems and Networks



Computer Architecture



Digital Logic



Data Representation



Hardware
(CPU, Memory, I/O Devices, Storage)



Applications
Word, Photoshop, Chrome...

Hardware
(CPU, Memory, I/O Devices, Storage)



Applications
Word, Photoshop, Chrome,...

Operating System
**(Windows, MS/DOS, Mac OS X, Linux, zOS,
QNX, VxWorks, pSOS, ThreadX,
Symbian, Blackberry OS, iOS, Android., Chrome..)**

Hardware
(CPU, Memory, I/O Devices, Storage)



Applications
Word, Photoshop, Chrome,...

Operating System
(Windows, MS/DOS, Mac OS X, Linux, zOS,
QNX, VxWorks, pSOS, ThreadX,
Symbian, Blackberry OS, iOS, Android., Chrome..)

BIOS

Hardware
(CPU, Memory, I/O Devices, Storage)



Applications
Word, Photoshop, Chrome,...

Operating System
(Windows, MS/DOS, Mac OS X, Linux, zOS,
QNX, VxWorks, pSOS, ThreadX,
Symbian, Blackberry OS, iOS, Android, Chrome...)

BIOS

**Device
Drivers**

Hardware
(CPU, Memory, I/O Devices, Storage)



Applications
Word, Photoshop, Chrome, ...

Java,
Pep/8, ...

Operating System
(Windows, MS/DOS, Mac OS X, Linux, zOS,
QNX, VxWorks, pSOS, ThreadX,
Symbian, Blackberry OS, iOS, Android, Chrome...)

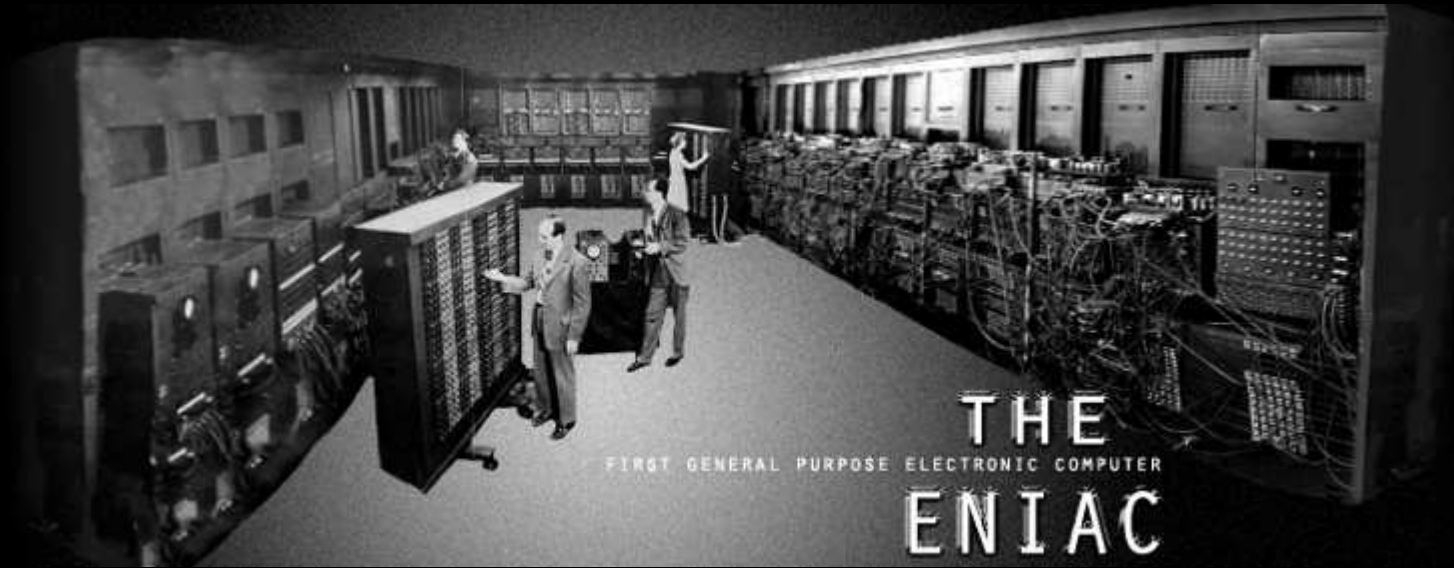
BIOS

Device
Drivers

Hardware
(CPU, Memory, I/O Devices, Storage)

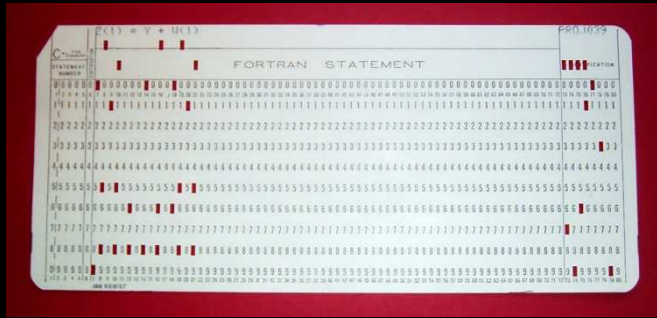


1946



1959





1960

1970

1980

1990

2000

2010



1960

CTSS
IBM 7094



1970

1980

1990

2000

2010



1960

CTSS
IBM 7094



OS/360

1970

1980

1990

2000

2010



1960

CTSS
IBM 7094



OS/360

1970

UNIX + C
PDP/7

1980

1990

2000

2010



1960

CTSS
IBM 7094



1970

CP/M
I_x86

UNIX + C
PDP/7

OS/360



1980

1990

2000

2010



1960

1970

1980

1990

2000

2010

CTSS
IBM 7094



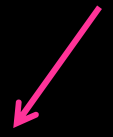
OS/360



MVS

UNIX + C
PDP/7

CP/M
I_x86



MS-DOS



1960

CTSS
IBM 7094



OS/360



MVS

1970

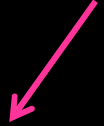
UNIX + C
PDP/7

BSD

System V

1980

CP/M
Ix86



MS-DOS

1990

2000

2010



1960

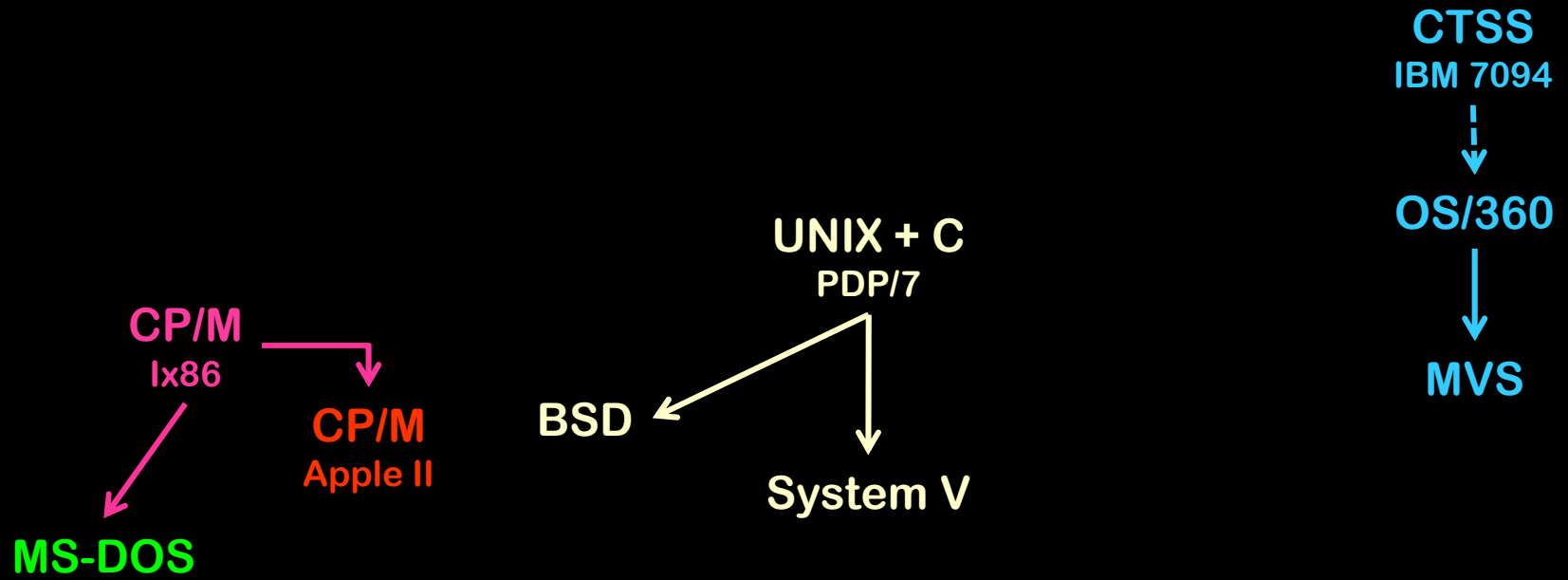
1970

1980

1990

2000

2010



1960

CTSS
IBM 7094

1970

UNIX + C
PDP/7

OS/360

1980

CP/M
Ix86

CP/M
Apple II

BSD

System V

MVS

MS-DOS

SunOS

Linux

HP-UX

AIX

Mac OS

1990

2000

2010



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CTSS
IBM 7094

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UNIX + C
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CP/M
Apple II

System V

MVS

MS-DOS

SunOS

Linux

HP-UX

Windows

Mac OS

Solaris

AIX

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System V

MVS

MS-DOS

SunOS

Linux

HP-UX

Windows

Mac OS

Solaris

AIX

1990

Windows
NT

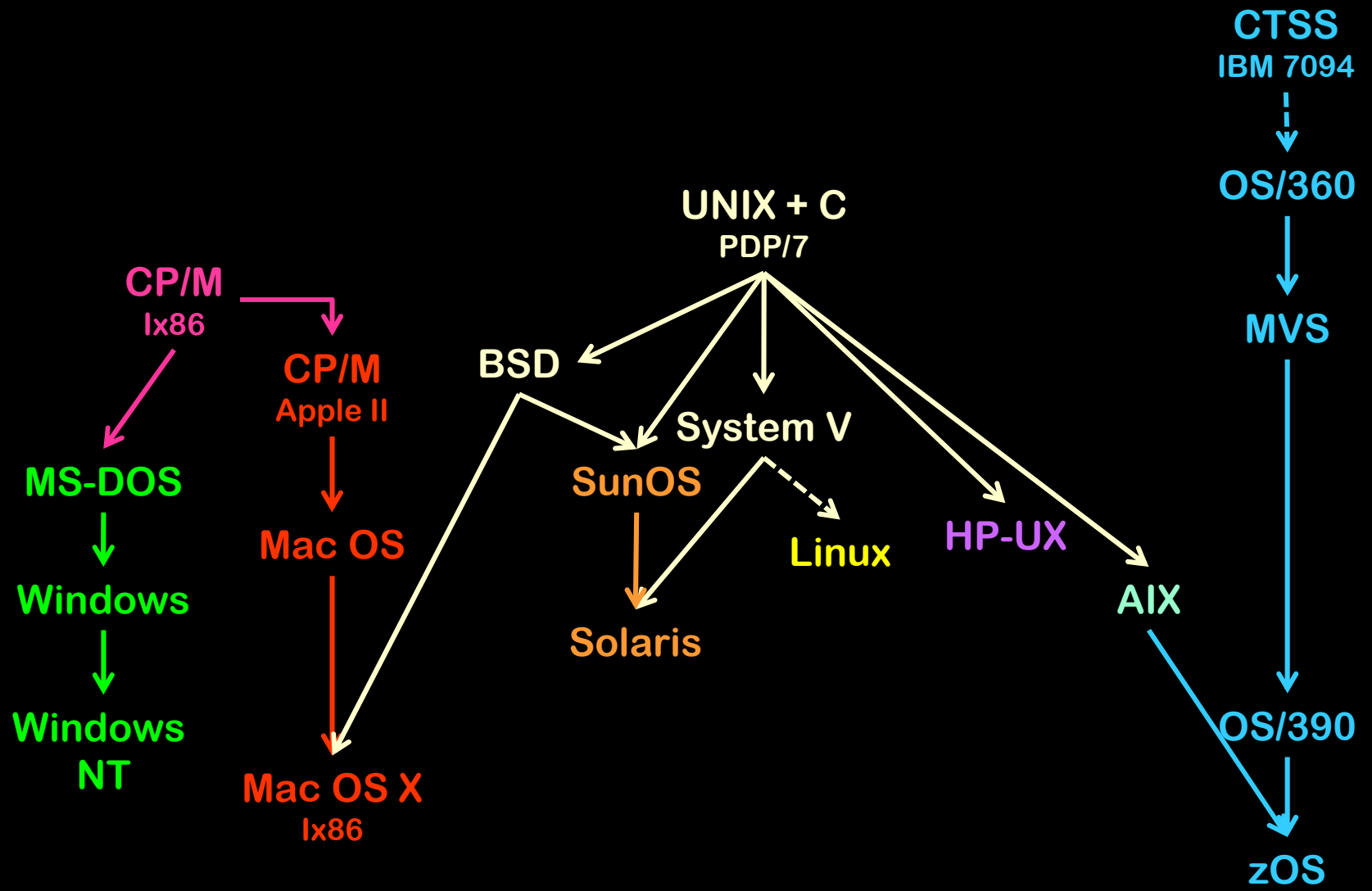
Mac OS X
Ix86

OS/390

2000

zOS

2010



1960

CTSS
IBM 7094

1970

UNIX + C
PDP/7

OS/360

1980

CP/M
Ix86

BSD

CP/M
Apple II

System V

MVS

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MS-DOS

SunOS

Mac OS

Linux

HP-UX

Windows

Solaris

AIX

OS/390

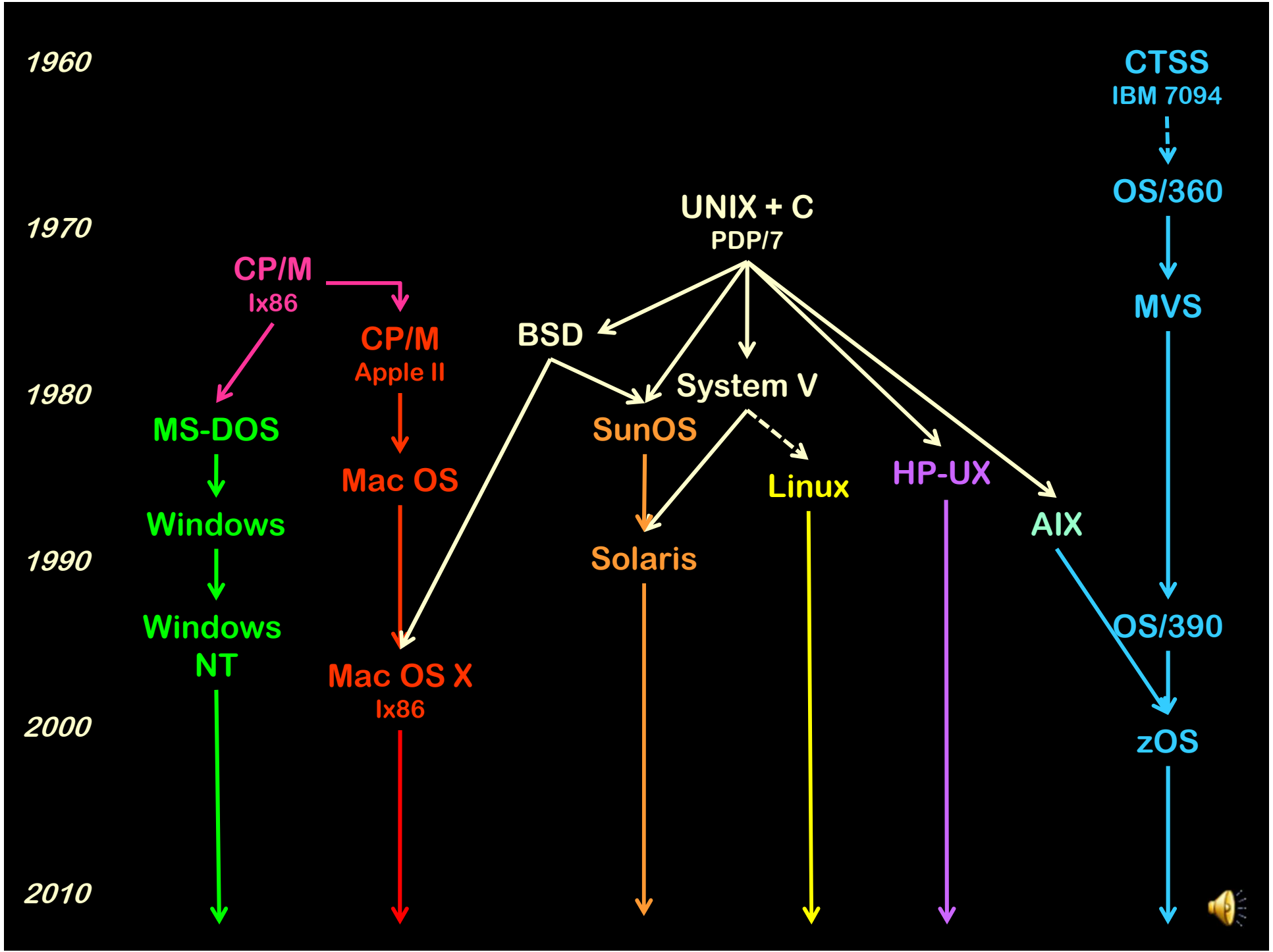
2000

Windows
NT

Mac OS X
Ix86

zOS

2010



Operating Systems

- Personal Computer
- “Servers” (in the Cloud and elsewhere)
 - File, Print, Compute, Transaction, ...



Operating Systems

- Personal Computer
- “Servers”
 - File, Print, Compute, Transaction, ...
- Cell Phone



Phone OS's

1960

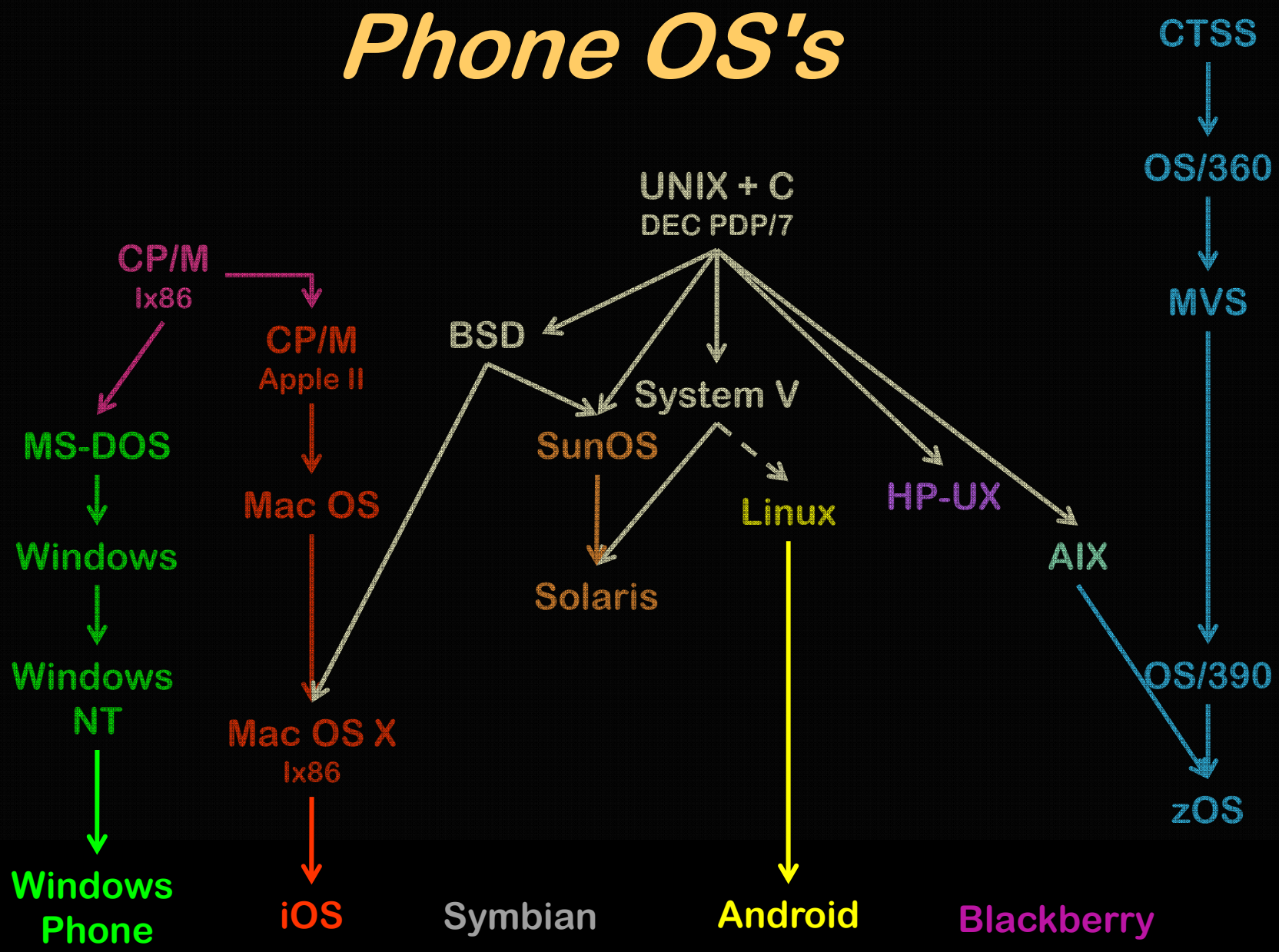
1970

1980

1990

2000

2010



Operating Systems

- “Servers”
 - File, Print, Compute, Transaction, ...
- Personal Computer / Tablet
- Cell Phone
- Router
- Robot
- Car



Operating Systems

- “Servers”
 - File, Print, Compute, Transaction, ...
 - Personal Computer / Tablet
 - Cell Phone
 - Router
 - Robot
 - Car
- } Real-Time =
guaranteed
"Response Time"

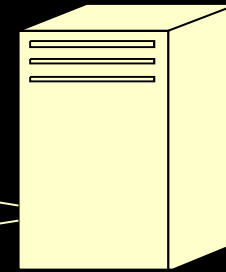


"Thin Clients"

Dumb
Terminals



Network



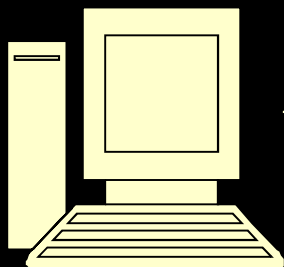
Google
Docs,
Dropbox,

...

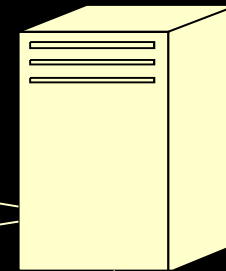


"Cloud Computing"

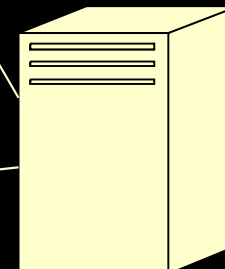
Dumb
Terminals



Network



Google
Docs,
Dropbox,
...



WHS
"Y"
Drive



Computer

- Memory
- CPU
- I/O Devices



Computer

- Memory
- CPU
- I/O Devices
- Information
 - Files



Computer

- Memory
- CPU
- I/O Devices
- Information
 - Files

Multiple user systems ("timesharing")



Computer

- Memory
- CPU
- I/O Devices
- Information
 - Files

Multiple user systems ("timesharing")
Single user systems - multiple apps



Multi-Programming

- Keeping multiple programs running "simultaneously"



Multi-Tasking

- Keeping multiple programs running "simultaneously"
- **Process** or **task** is an executing program (or part of one)



Multi-Tasking

- Keeping multiple programs running "simultaneously"
- **Process** or **task** is an executing program (or part of one)
- The CPU can only execute one process at a time, but each process wants to think it's the only one



OS Manages Resources

- Memory
- CPU
- I/O Devices
- Information
 - Files

**Sharing
Nicely**

**Multiple user systems ("timesharing")
Single user systems - multiple apps**



Everyone's sharing the computer



Everyone's sharing the computer



but they don't really want to know that...

