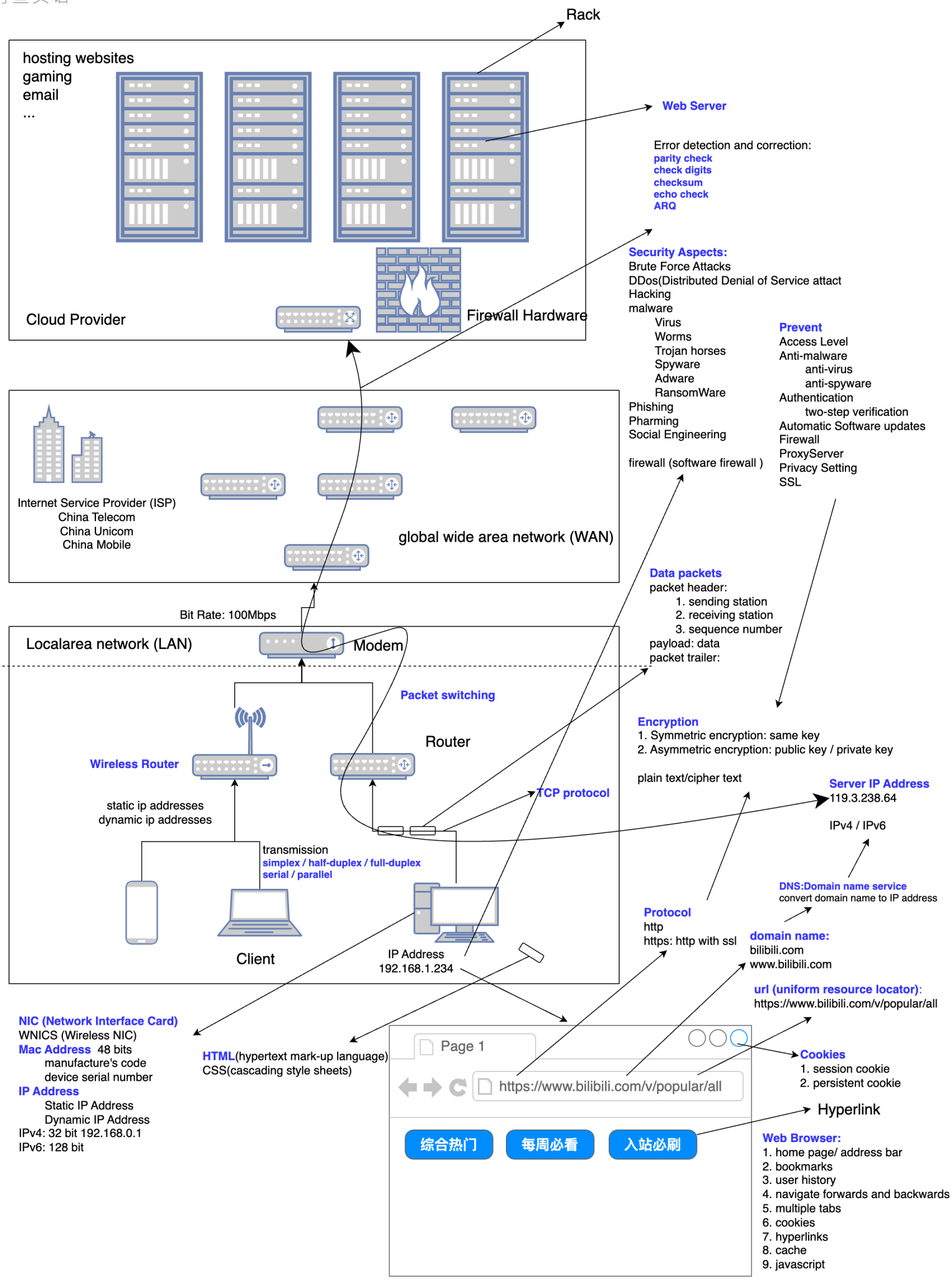
IGCSE Computer Science 0478 for (2023-2025)
Chapter 2 Data transmission, Chapter 5 The internet and its use



IGCSE Computer Science 0478 for (2023-2025)
Chapter 3 Hardware, Chapter 4 Software

有鱼英语

Intel Core 2 Duo Processor
3.0GHz, E8400 Wolfdale

fetch-execute cycle
Fetch -> Decode -> Execute

Core 1
Throughput: ~1 **instruction** per cycle. One **cycle** takes ~0.33 nanoseconds. The exact number of cycles depends on the instruction

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SRAM
L1 Data Cache
32 KB
Latency: 1ns (3 cycles)

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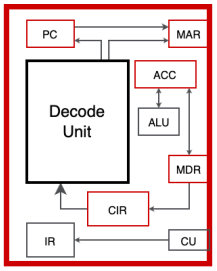
L2 Data Cache
6 MB
Latency: 4.7ns (14 cycles)

The CPU interacts with the outside world solely through a set of pins; it doesn't concern itself with what actually exists out there. The CPU primarily interacts with the external environment through three methods: memory address space, I/O address space, and interrupts.



(OS)Handling Interrupt
1. Timing single
2. Input/Output process
3. Hardware fault
4. User interaction
5. Software error

(OS)Manage Multitasking
1. resources allocate specific processor time
2. processes can be interrupted

Address Bus
33 **Address** Pins
A[35:3]#

36 bit address
8 byte
Total (64GB physical memory)

Data Bus
64 **Data** Pins
A[63:0]#

Control Bus
5 **Request** Pins
A[4:0]$

produce timing signals

Front Side Bus
133MHz DDR3
Bandwidth: 10GB/s

NUMA (Non-Uniform Memory Access)
after 2009 nehalem

Provide an interface
1. Command line interface (**CLI**)
2. Graphical user interface (**GUI**)

CRT Display

LCD Display

PCI Express x16 Graphics
(Graphic Card)

VGA
HDMI

PCI Express x16, 8GB/s
(each way)

Inter X48
Northbridge chip

UMA (Uniform Memory Access)
before 2009 nehalem

DRAM
Main Memory
RAM modules ~ 8GB
Latency: ~83 ns(~250cycles)

Memory Management
1. data moved between RAM and HDD/SSD
2. protention to prevent two competing applications from using the same memory locations at the same time

Security Management
1. software update, last version
2. access right
3. anti-virus, firewall
4. integrity, confidentiality and availability data

DMI Interface
Bandwidth: 1GB/s (each way)

PCIe x1, 500MB/s (each way)

NIC (Network interface card)

100 Mbit wired ethernet ~ 10MB/s

Gigabit wired ethernet ~ 100MB/s

Wireless 802.11b ~ 1MB/s

Wireless 802.11g ~ 2.5MB/s

Serial ATA(SATA) Port.
300 MB/s

Intel ICH9R
Southbridge chip

SIO

keyboard

mouse

USB (Universal Serial Bus)

Managing Peripherals and drivers
1. device drivers
2. manage queues and buffers

Inkjet printer

Laser printer

microphone

ADC (Analogue --> Digital Data)

Speaker

DAC (Digital Data --> Analogue)

BIOS (Flash memory)
ROM

Power Management

Clock

Sound Card

Managing User account
1. user login
2. user's data store in separate part of memory

SSD (Solid State Driver)

750GB Hard Disk Driver
7,200 RPM Western Digital

16MB
Hard Disk Driver Cache
Operates at SATA rate

OS

Virtual memory

Sustained Disk I/O
(minimal seeks)
~ 60 MB/s

Average Read Seek Time:
~13.7ms (41 million cycles)

Average Read Seek Time:
~15ms (45 million cycles)

Managing Files
1. maintains file directories
2. file name conventions

Providing a platform for running applications