

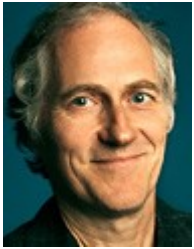
Операційні системи

Що залишилось за рамками

Всеволод Дьомкін

КПІ, ФІВТ, АСОІУ, 2015

ОС Інтернету



“ОС Інтернету — це ОС обробки інформації”
– Tim O'Reilly

Інтернет – це розподілена система з розподіленою “ОС”.

Її компоненти:

- Пошук
- Доступ до медіа-даних
- Передача повідомлень
- Встановлення особистості і соціальний граф
- Платежі
- Локація
- Потoki активностей
- Час

<http://radar.oreilly.com/2010/03/state-of-internet-operating-system.html>

Amazon Web Services

‘The Cloud’ (noun): A data center in North Virginia

Amazon Web Services






Compute

-  **EC2**
Virtual Servers in the Cloud
-  **EC2 Container Service**
Run and Manage Docker Containers
-  **Elastic Beanstalk**
Run and Manage Web Apps
-  **Lambda**
Run Code in Response to Events

Storage & Content Delivery

-  **S3**
Scalable Storage in the Cloud
-  **CloudFront**
Global Content Delivery Network
-  **Elastic File System** PREVIEW
Fully Managed File System for EC2
-  **Glacier**
Archive Storage in the Cloud
-  **Import/Export Snowball**
Large Scale Data Transport
-  **Storage Gateway**
Hybrid Storage Integration

Database

-  **RDS**
Managed Relational Database Service
-  **DynamoDB**
Managed NoSQL Database
-  **ElastiCache**
In-Memory Cache
-  **Redshift**
Fast, Simple, Cost-Effective Data Warehousing
-  **DMS** PREVIEW
Managed Database Migration Service








Networking

-  **VPC**
Isolated Cloud Resources
-  **Direct Connect**
Dedicated Network Connection to AWS
-  **Route 53**
Scalable DNS and Domain Name Registration

Developer Tools

-  **CodeCommit**
Store Code in Private Git Repositories
-  **CodeDeploy**
Automate Code Deployments
-  **CodePipeline**
Release Software using Continuous Delivery






Management Tools

-  **CloudWatch**
Monitor Resources and Applications
-  **CloudFormation**
Create and Manage Resources with Templates
-  **CloudTrail**
Track User Activity and API Usage
-  **Config**
Track Resource Inventory and Changes
-  **OpsWorks**
Automate Operations with Chef
-  **Service Catalog**
Create and Use Standardized Products
-  **Trusted Advisor**
Optimize Performance and Security

Security & Identity

-  **Identity & Access Management**
Manage User Access and Encryption Keys
-  **Directory Service**
Host and Manage Active Directory
-  **Inspector** PREVIEW
Analyze Application Security
-  **WAF**
Filter Malicious Web Traffic



Analytics

-  **EMR**
Managed Hadoop Framework
-  **Data Pipeline**
Orchestration for Data-Driven Workflows
-  **Elasticsearch Service**
Run and Scale Elasticsearch Clusters
-  **Kinesis**
Work with Real-Time Streaming Data
-  **Machine Learning**
Build Smart Applications Quickly and Easily








Internet of Things

-  **AWS IoT**
Connect Devices to the Cloud

Mobile Services

-  **Mobile Hub** BETA
Build, Test, and Monitor Mobile apps
-  **Cognito**
User Identity and App Data Synchronization
-  **Device Farm**
Test Android, FireOS, and iOS Apps on Real Devices in the Cloud
-  **Mobile Analytics**
Collect, View and Export App Analytics
-  **SNS**
Push Notification Service

Application Services

-  **API Gateway**
Build, Deploy and Manage APIs
-  **AppStream**
Low Latency Application Streaming
-  **CloudSearch**
Managed Search Service
-  **Elastic Transcoder**
Easy-to-Use Scalable Media Transcoding
-  **SES**
Email Sending and Receiving Service
-  **SQS**
Message Queue Service
-  **SWF**
Workflow Service for Coordinating Application Components

Enterprise Applications

-  **WorkSpaces**
Desktops in the Cloud
-  **WorkDocs**
Secure Enterprise Storage and Sharing Service
-  **WorkMail** PREVIEW
Secure Email and Calendaring Service

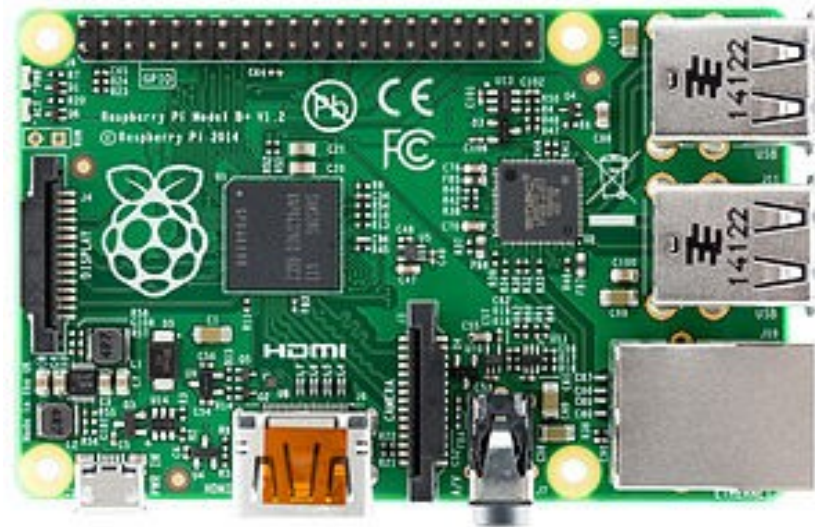
Альтернативні мови системного програмування

- Rust
- D
- Go
- Erlang
- Ocaml
- Haskell
- Lisp

<https://www.quora.com/Which-language-has-the-brightest-future-in-replacement-of-C-between-D-Go-and-Rust-And-Why>

Нові апаратні форм-фактори

- Arduino
- Android
- Raspberry Pi
- ODROID
- ...



ОС реального часу

- VxWorks
- QNX
- FreeRTOS

Особливі алгоритми планування процесів:

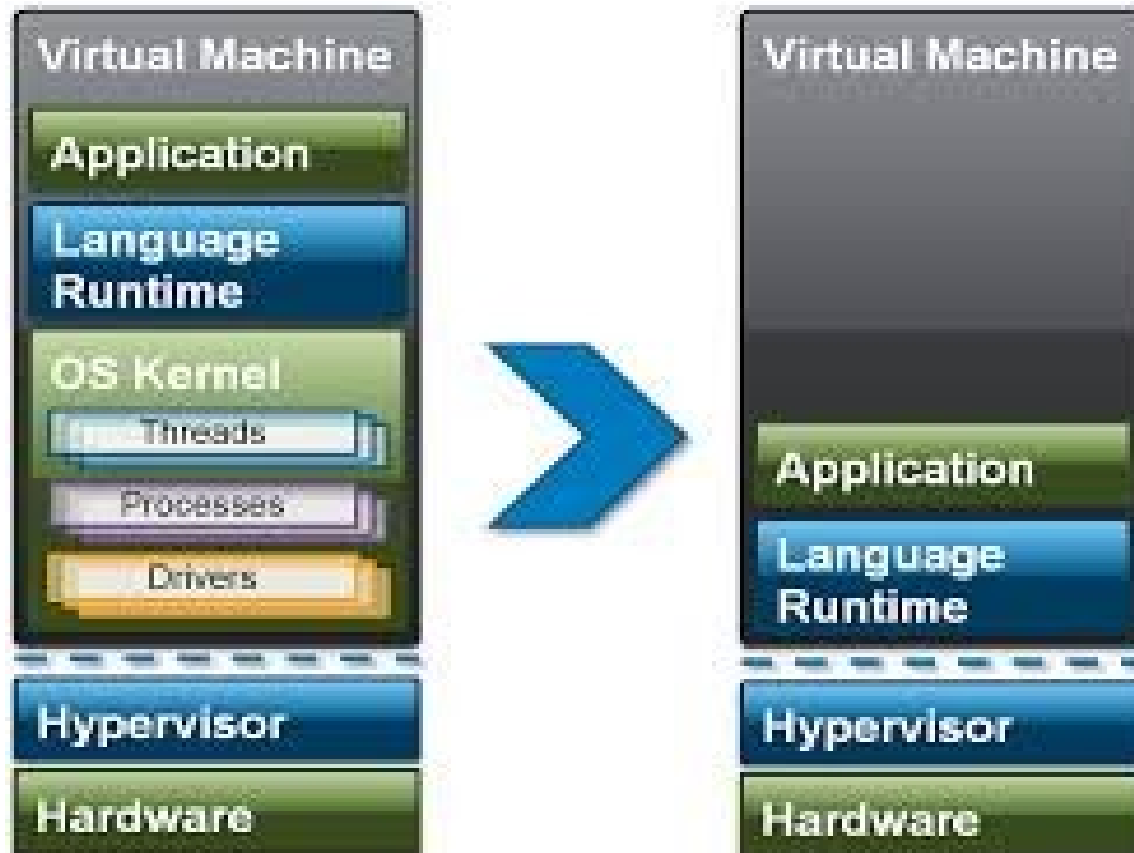
- Rate-monotonic scheduling
- Fixed priority pre-emptive scheduling, an implementation of preemptive time slicing
- Fixed-Priority Scheduling with Deferred Preemption
- Fixed-Priority Non-preemptive Scheduling
- Critical section preemptive scheduling
- Static time scheduling
- Earliest Deadline First scheduling

Контейнери

Mechanism	Operating system	License	Available since/between	Features									
				File system isolation	Copy on Write	Disk quotas	I/O rate limiting	Memory limits	CPU quotas	Network isolation	Nested virtualization	Partition checkpointing and live migration	Root privilege isolation
chroot	most UNIX-like operating systems	varies by operating system	1982	Partial ^[a]	No	No	No	No	No	No	Yes	No	No
Docker	Linux ^[7]	Apache License 2.0	2013	Yes	Yes	Not directly	Not directly	Yes	Yes	Yes	Yes	No	No
Linux-VServer (security context)	Linux	GNU GPLv2	2001	Yes	Yes	Yes	Yes ^[b]	Yes	Yes	Partial ^[c]	?	No	Partial ^[d]
lxc	Linux	Apache License 2.0	2013	Yes	Yes	Yes	Yes ^[b]	Yes	Yes	Partial ^[c]	?	No	Partial ^[d]
LXC	Linux	GNU GPLv2	2008	Yes ^[9]	Yes	Partial ^[e]	Partial ^[f]	Yes	Yes	Yes	Yes	No	Yes ^[9]
LXD	Linux	Apache License 2.0	2015	Yes	Yes	Partial(see LXC)	Partial(see LXC)	Yes	Yes	Yes	Yes	Partial ^[g]	Yes
OpenVZ	Linux	GNU GPLv2	2005	Yes	No	Yes	Yes ^[h]	Yes	Yes	Yes ^[i]	Partial ^[j]	Yes	Yes ^[k]
Virtuozzo	Linux, Windows	Proprietary	2000 ^[14]	Yes	Yes	Yes	Yes ^[l]	Yes	Yes	Yes ^[i]	Partial ^[m]	Yes	Yes
Solaris Containers (Zones)	illumos (OpenSolaris), Solaris	CDDL, Proprietary	2004	Yes	Yes (ZFS)	Yes	Partial ^[n]	Yes	Yes	Yes ^{[o][17][18]}	Partial ^[p]	Partial ^{[q][r]}	Yes ^[s]
FreeBSD jail	FreeBSD	BSD License	2000 ^[20]	Yes	Yes (ZFS)	Yes ^[t]	No	Yes ^[21]	Yes	Yes ^[22]	Yes	No	Yes ^[23]
sysjail	OpenBSD, NetBSD	BSD License	2006–2009 (As of March 3, 2009, it is no longer supported)	Yes	No	No	No	No	No	Yes	No	No	?
WPARs	AIX	Proprietary	2007	Yes	No	Yes	Yes	Yes	Yes	Yes ^[u]	No	Yes ^[25]	?
HP-UX Containers (SRP) [Ⓔ]	HP-UX	Proprietary	2007	Yes	No	Partial ^[v]	Yes	Yes	Yes	Yes	?	Yes	?
iCore Virtual Accounts	Windows XP	Proprietary/Freeware	2008	Yes	No	Yes	No	No	No	No	?	No	?
Sandboxie	Windows	Proprietary/Shareware	2004	Yes	Yes	Partial	No	No	No	Partial	No	No	Yes
Spoon	Windows	Proprietary	2012	Yes	Yes	No	No	No	No	Yes	No	No	Yes
VMware ThinApp	Windows	Proprietary	2008	Yes	Yes	No	No	No	No	Yes	No	No	Yes

Уніядра

- Erlang-on-xen/LING
- MirageOS (OCaml)
- Clive (go)
- HaLVM (Haskell)



Переконфігуровані комп'ютери

FPGA Basics

