Generic IP Support for Collaboration Amongst Distributed Nodes

AFIN 2013 Plenary Discussion
Distributed Systems Today

- Distributed Storage Networks (e.g., DHTs and Torrent)
- Cloud Computing
- Distributed Messaging (e.g., Freenet, but also distributed social networks)

...
Assumption

Distributed structures built and maintained by a large number of nodes will commonly seen in future internet.

More general:
*Collaboration* amongst a large number of distributed nodes will be commonly seen in future internet.
Are there *generic ways* for the *routing layer* to support *collaboration* amongst *distributed* nodes?
Simple Examples

1. Synchronisation in DS often occurs in form of multicasts. Current IP multicasts are (still) rather static and complicated to handle. Ad-hoc dynamic multicasts crossing borders of local-area-networks could help.

2. Nodes can be temporarily offline or busy with other tasks. The routing layer could provide mechanisms of caching packets over longer periods of time.
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PANEL:
New Internet Applications and Services Supported via IPv6, IoT, and Security Platforms

Position of: Renzo Davoli
Virtual Square Lab
Computer Science and Engineering Department
University of Bologna
Science...

- Science has no dogmas
- No legacy in scientific research
- Concepts evolve
- Nothing if forbidden:
  - consistency and convenience are the goals
- Features first (optimization, efficiency, performance then)
The two elephants...

- David Clark (M.I.T.): “the apocalypse of the two elephants”, Fig. 1-23 of A. Tanenbaum: *Computer Networks* 4th Ed.
Networking

- IPv6 is not IPv4 using longer addresses!
- IPv6 opens a number of new challenges in networking.
My research interests:

- Virtuality
- Operating Systems
- Networking
- Security
- CS Education
What does a network connect?

- Computers?
- networking controllers?
- Things?
- Threads!
  - *(ICIW 2013: Internet of Threads)*
  - processes
Which kind of network do we use?

- Real (physical) networks?
- Virtual networks? (Tridentcom 2005)
- ANY networks!
  - Real and virtual networks are undistinguishable!
What is a networking stack?

- A module of the Operating System?
- A server process of a microkernel?
- A library!

- Berkeley Sockets API does not support processes using multiple stacks:
  - Msockets (ACM SAC 2012)
How does we assign addresses/names to networking entities?

- By hand? Autoconfiguration?
- DHCP/DNS?
- Hash based addresses! (AFIN 2013)

Prefix: 2001:a:b:c::/64
Name: tizio.rome.mycorp.org
Hash: 9e50:7571:373:6ab2
Who is entitled to configure networking?

- System/Network administrators?
- Device owners?
- Users!
  - Networking configuration can be an unprivileged operation.
... on security: security by obscurity does not work

- A system is NOT safer because its design is secret!

  - Le système doit être matériellement, si non mathématiquement, indéchiffrable ;
  - Il faut qu'il n'exige pas le secret, et qu'il puisse sans inconvénient tomber entre les mains de l'ennemi ;
Components of a Security Service

● Hardware
● Software
● Humanware!!!
  ● Daily work, awareness, security culture.
Security:

- It is not a status
- It is a process
- Awareness is the key-word!
- The myth of being able to do what you are not able to understand is the main security threat.
- Security is a cost (and most of the times companies try to avoid it!).
Principle of Least Privilege

- Nobody should be given more privileges than those needed for his/her/its legitimate purpose.
- My proposal: avoid the *global view assumption* and use partial virtual machines to avoid overuse of system administration privileges. (View-OS. ICCS 2008)
Security and Privacy

- Security methods are often used to preserve users' privacy.
- But sometimes there is a trade-off between them:
  - A company which does not disclose a security problem (privacy), creates a security problem!
... non disclosure problem:

- A fake feeling of security is worse than being insecure
- It is not possible to take countermeasures...
Who is worthy to be trusted?

- Business companies?
- Institutions?
- Communities?
- Nobody. (Galilei's experimental method)
Communication Problems
We are still creating art and beauty on a computer:

the art and beauty of revolutionary ideas translated into (libre) code...

renzo, rd235, iz4dje