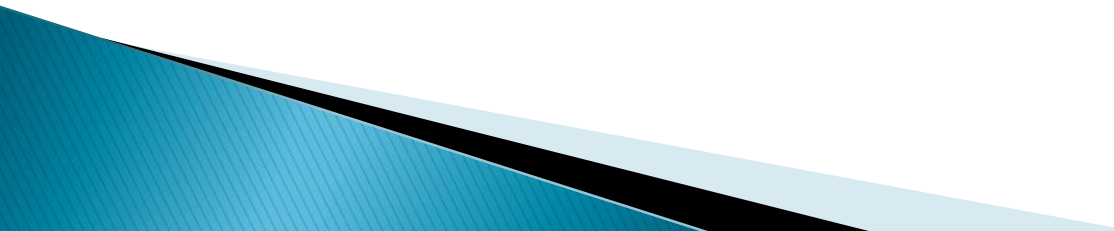# Generic IP Support for Collaboration Amongst Distributed Nodes

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.
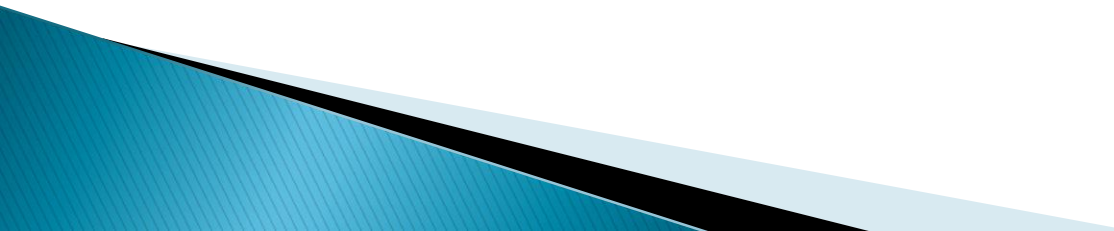
More general:

Collaboration amongst a large number of distributed nodes will be commonly seen in future internet.

Question:

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.

AFIN 2013

PANEL:
New Internet Applications and Services Supported
via IPv6, IoT, and Security Platforms

Position of: Renzo Davoli
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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.

Figure 1-23. The apocalypse of the two elephants.
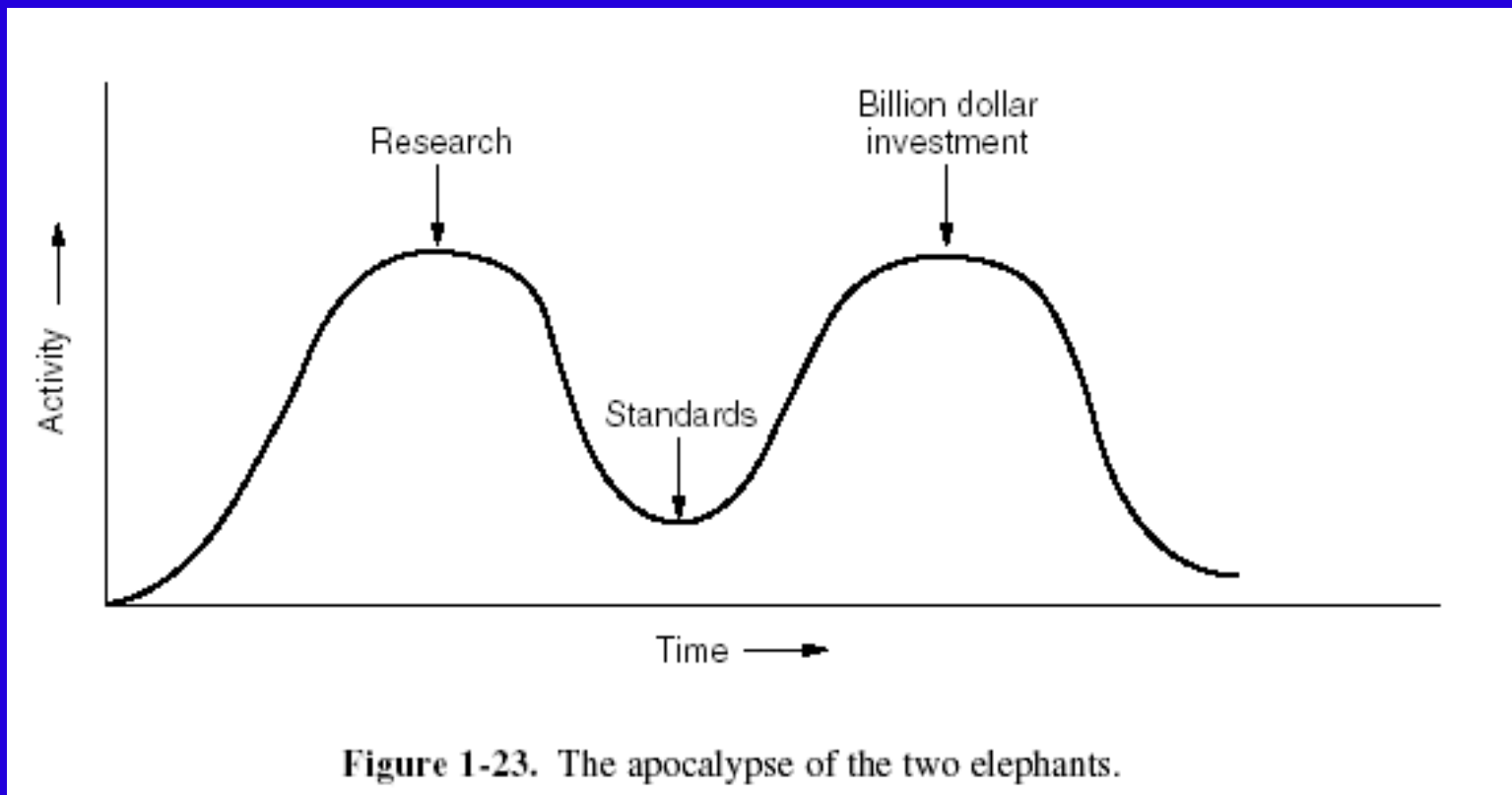
Networking

- 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!

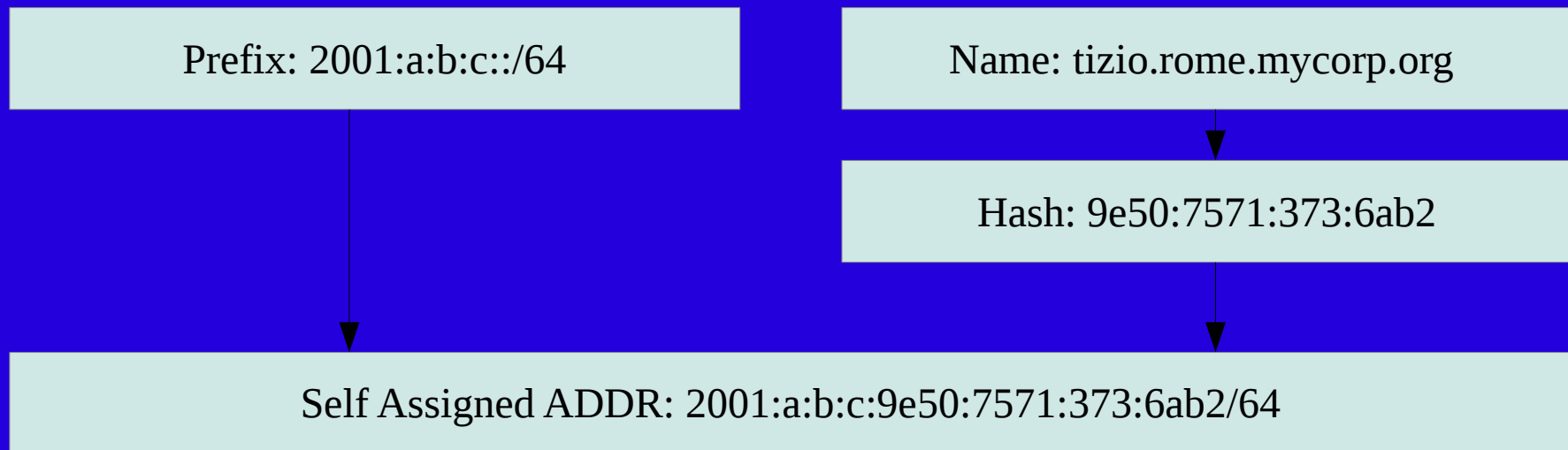   - Real and virtual networks are undistiguishable!

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

Self Assigned ADDR: 2001:a:b:c:9e50:7571:373:6ab2/64

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!

- Auguste Kerckhoffs, La cryptographie militaire, Journal des sciences militaires, vol. IX, pp. 5-83, Jan. 1883, pp. 161-191, Feb. 1883.:

  - Le système doit être matériellement, si non mathématiquement, indéchiffrable ;

  - Il faut qùil n'exige pas le secret, et qùil 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 priviledes 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...

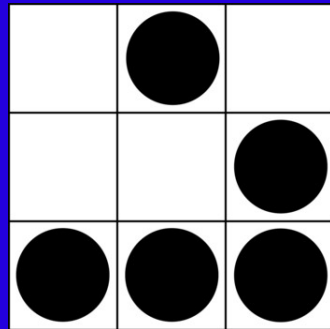# Who is worthy to be trusted?

- 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