

OTHER WAYS OF RESEARCH

Since the year 2K, research programs have been launched by IUT on **new network architectures** to solve the lacks of the current Internet.

For example:

In the US, the **Named Data Networking (NDN)**, whose model is focused on content, the **GENIE** project and **MobilityFirst**, based on mobile services and funded by the **National Science Foundation (NSF)**.

In **Europe**, the **4WARD** project was to create a network architecture where information is independent of its location.

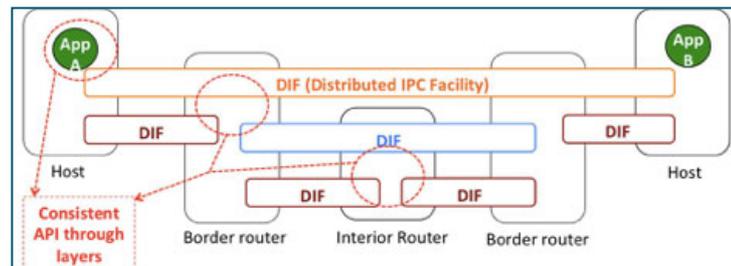
These programs have all remained at the project level.



RINA is a new network architecture designed to unify distributed computing and telecommunications.

RINA, designed in 2008

In 2008, an ARPANET pioneer, **John Day**, published a book: *Patterns in network architecture: a return to fundamentals*. He proposes an alternative to TCP/IP, based on the datagram of the Cyclades project: he calls this new architecture **RINA**.



The structure of RINA is based on a repetitive layer (the DIF)

Addressing in a rational way

In TCP/IP, addresses are assigned to interfaces, not nodes. This makes true multi-homing impossible to support because the network does not know that two interface addresses reach the same node. It also makes router routing tables 3 to 4 times larger, and on the other hand, it complicates mobility.

A single layer

The specificity of RINA is that it is based on a single layer type, which is repeated as many times as necessary by the network designer.

This is the DIF

(Distributed IPC Facility).

A distributed application that provides inter-process communication services (IPC).

These two terms - DIF and IPC - are the semantic bases of RINA.

RINA, the crusade of Louis Pouzin, one of the fathers of the Internet



Inventor of the Shell language and of the basic protocol of the Internet, the datagram, he has been speaking out against the lack of security and the instability of TCP/IP for years.

In RINA, John Day has taken up the fundamentals of the Cyclades project, which was in 1974

withdrawn by the French government in favor of the Minitel. The USA chose the datagram in 1977.

Since 2017 Louis Pouzin travels the world to promote the new RINA architecture.

RINA in Europe

Nearly 300 researchers are working in the world on the development of RINA. The main bases are in Spain (i2cat, University of Barcelona), Ireland (TSSG Laboratory, Dublin), the USA (Boston University), Norway (University of Oslo) and, since March 2021, in Japan.

From fundamental research to industrial experimentation, RINA is at the center of tomorrow's Internet developments

Armenia has chosen RINA

In October 2018, Armenia chose to move its infrastructure under RINA and create a university training curriculum open to the world. It is the first country to have made this choice.

The RINArmenia project is currently being implemented in Yerevan, despite the country's problems:

- A team of computer engineers are developing RINA protocols;
- A university training program dedicated to RINA started in January 2020 in Yerevan.



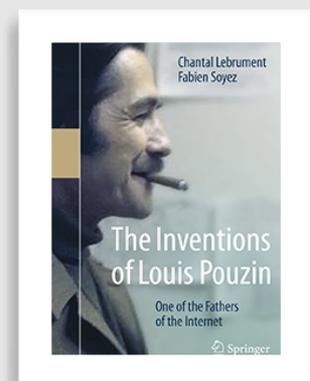
You want to test RINA ?
The **RLITE** project is open source for your developers

The RLITE code is in C/C++, adaptable also for Python, and is available on the dedicated site for developers, **GitHub** :

```
[ 3712.511159] [DBG]dif_get: DIF rinawlpwd.DIF [t
[ 3712.511161] [DBG]rl_shim_eth_create: New IPC cre
[ 3712.511162] [INF]rl_lpcp_create: IPC process 0 t
[ 3712.512591] [INF]rl_lpcp_ulpcp_set: IPC process
[ 3712.512591] [DBG]rl_shim_eth_config: netdev set
[ 3712.512591] [INF]rl_lpcp_config: Configured IPC
[ 3712.648981] [brcnfmac: brcnf_inetaddr_changed: fi
[ 3714.516741] [DBG]dif.oet: DIF n.DIF [tuse "norm
```

<https://github.com/rlite/rlite>

To discover the story of Louis Pouzin :



« The Inventions of Louis POUZIN »

Fabien Soyez
Chantal Lebrument
(Springer Ed.)

In 1972, Bob Metcalfe (Ethernet inventor), said: *"the fundamental function of the network is to provide communication between the processes, and only that".*

Next Generation Network

In 1995, the ITU launched work on NGNs to meet the "Quality of Service" (QoS) needs of its telephony operator customers.

The goal was to replace the switched telephone network with a packet-based network architecture.

But for the ITU, an NGN must meet certain criteria, including being able to leverage IP technologies, while being able **to provide end-to-end Quality of Service, both on fixed AND mobile networks.**

RINA, a reliable and resilient architecture

The main use cases for RINA are private or public networks, Internet of Things networks and highly secure client-server applications. The interface between a RINA zone and the rest of the TCP/IP Internet can be done through open roots like those provided by Open-Root.

Security

The RINA infrastructure is immune to attacks from the outside, unlike those on the TCP/IP network where IP addresses are public, whereas **in RINA they are secure containers.** Most of your firewalls, session controllers and intrusion protection systems disappear. No need to scan ports, even less risk of attacks.

Simplicity

The wished type of communication can be: **best effort** and **Quality of Services**, when creating the inter-process communication channel.

Inter-process communication is a unique and simplified network model through which any type of communication becomes possible, without having to resort to specialized protocols, unlike the current architecture of the Internet.

**"Complexity is the n°1 enemy of security"
(Louis Pouzin)**

Mobility

For TCP/IP to handle mobility, it would require application names that do not change as the mobile host moves with addresses that change as the host moves.

In RINA network designers can freely decide the number and scope of DIFs in the network.

RELIABILITY

Multi-homing goes from complex to simple. Reliability becomes a matter of course, easy to guarantee.

FLEXIBILITY

You can implement any QoS principle within the architecture, not just "Best of Effort", and create a custom system to allocate resources according to your priorities.

SCALABILITY

The recursive structure scales indefinitely. No more exploding routing table size.

PERFORMANCE

Better resource monitoring and information sharing between processes.

COSTS

No more upgrades, server and bandwidth savings, flexible virtual architecture for reconfiguration as needed.

"RINA is a new network architecture designed to unify distributed computing and telecommunications" (ETSI)

In February 2019, the European certification body ETSI reviewed RINA



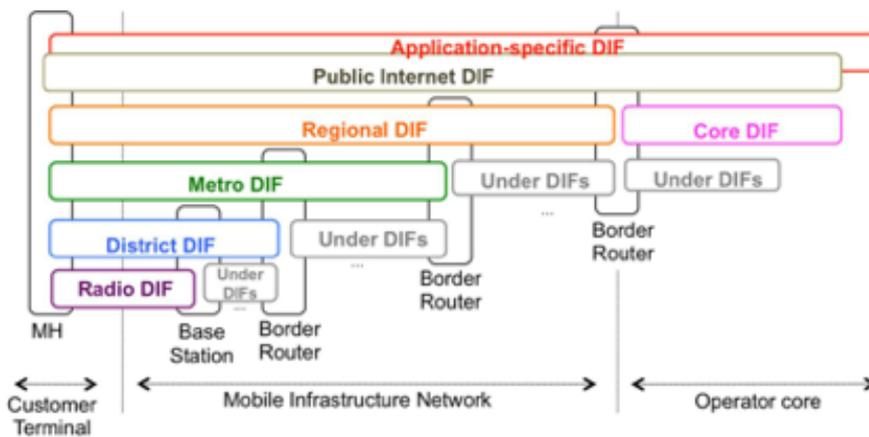
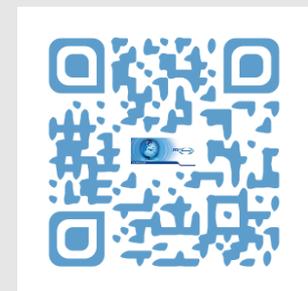
"RINA allows to solve problems that are generic to a network (e.g. structure, naming and addressing, security models or QoS) at the architecture level"

www.etsi.org

A very complete report of 66 pages, graphs, a lexicon and a list of abbreviations...

RINA, the future for communication networks

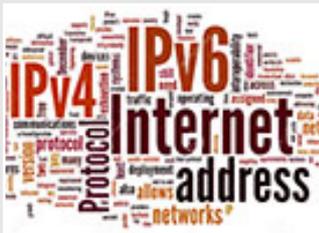
Download this ETSI report by clicking on the QR Code below



In RINA network designers can freely decide on the number and scope of DIFs in the network.

IPv4 → IPv6

The IPv4 version of the IP protocol was validated in 1981. Since the 1990s the IETF wanted to make it evolve. The IPv6 version was published in 1998 and standardized in 2017.



V6 vs V4

BASED ON THE SAME PRINCIPLES AS THE V4 PROTOCOL, ADDRESSING IN V6 IS EVEN MORE CONSUMING IN THE USE OF ROUTING TABLES. BUT ABOVE ALL, IPV6 DOES NOT MANAGE MOBILITY OR MULTI-HOMING.

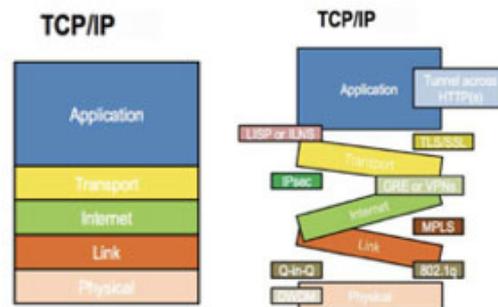
IETF RFC 6275: "Mobility support in IPv6", July 2011



Transmission Control Protocol/ Internet Protocol (TCP/IP)

Why TCP/IP has problems

Network architectures are primarily based on the paradigm of functional layers, each of which performs different functions executed by different, but independently designed protocols. These protocols have evolved without any organization to resolve individual use cases as they arose, invalidating the original architectural model and increasing the complexity of networks.



In TCP/IP, the functions of the different layers are not independent.

40 years later and more than 4 billion users

The Internet compared to 1983, it's: broadband, voice & TV over IP, mobility, Internet of things...

The TCP/IP protocol was not designed to support such a diversity of applications

TCP/IP manages a data transport network through interfaces

RINA manages the communication between programs through a network.



Initiated by Boston University, the PSOC website is the focal point for all developments and initiatives on RINA.

The goal of PSOC is to provide a forum for developing sustainable solutions to the current Internet architecture crisis. Participation is open to both academic and industrial network members.

Through meetings, collaboration and publications, they seek to guide the emergence of the RINA architecture.

This will meet the needs of users for decades to come.

Jointly managed by the Barcelona i2Cat lab and the Boston University team, this website concentrates research advances on RINA.

Contact: info@pouzinsociety.org
 Site: <http://pouzinsociety.org>

RINA Workshop

An annual meeting is held in Paris (France) as part of the ICIN meeting at the end of February. This is where all the researchers meet and present their progress in the Internet of the future.



ICIN 2019, Paris - In the center, Louis Pouzin and John Day

Terminologie de RINA

<http://pouzinsociety.org/education/terminology>

Some RINA Research Programs



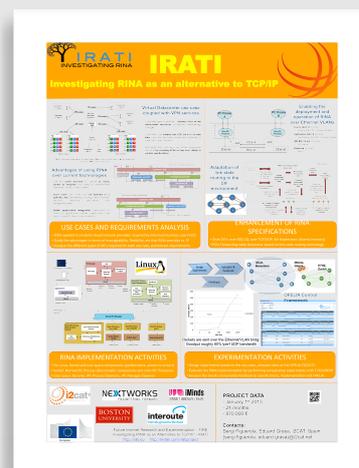
<http://ict-arcfire.eu>



<http://www.irati.eu/>



<http://ict-pristine.eu/>



IRATI program poster

RINA's advantages



Mobility management without specialized protocols



Effective security at lower cost



Better network management



Recursiveness: stop designing and coding protocols from scratch



Quality of service and good use of resources (bandwidth savings)



Possible search for applications in different networks



Amazing speed tests:
+ **more than 1000 times faster** than TCP/IP

MORE

FOLLOW THE LATEST NEWS ON RINA

<http://pouzinsociety.org/>

RINA WORKSHOP 2019

<http://pouzinsociety.org/node/76>

L'ETSI REPORT

<http://www.etsi.org/standards-search>

Last meeting

RINA WORKSHOP 2020

<http://www.icin-conference.org/rina-2020/>

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