Experimental evaluation of a Recursive InterNetwork Architecture prototype

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Basic concept of the Recursive InterNetwork Architecture

Theory

Applications
- TCP/UDP (L4)
- IP (L3)
- Ethernet (L2)
- Physical Media (L1)

Everyday practice

Applications
- UDP (L4)
- IP (L3)
- VXLAN (L2)
- UDP (L4)
- IP (L3)
- IP (L3)
- IEEE 802.3 (L2)
- MPLS (L2.5)
- IEEE 802.1Q (L2)
- IEEE 802.1ah (L2)
- 10GBASE-ER (L1)

RINA

Applications
- DIF
- DIF
- DIF
- Physical Media
IPC API

- APs communicate using a portId
- 6 operations:
  - `int _registerApp(appName, List<difName>)`
  - `portId _allocateFlow(destAppName, List<QoSParams>)`
  - `int _write(portId, sdu)`
  - `sdu _read(portId)`
  - `int _deallocate(portId)`
  - `int _unregisterApp(appName, List<difName>)`

- QoSParams are defined in a technology-agnostic way
  - Bandwidth-related, delay, jitter, in-order-delivery, loss rates, ...
Architectural Model

Application Specific Tasks
- Multipl exing
- IPC Resource Mgt.
- SDU Protection
- DIF Allocator

Other Mgt. Tasks
- IPC Mgt. Tasks
- DIF Process
- Mgmt Agent

System (Host)
- Appl. Process
- Shim IPC Process
- IPC Process
- Mgmt Agent

System (Router)
- Appl. Process
- Shim IPC Process
- DIF
- IPC Process
- Mgmt Agent

System (Host)
- Appl. Process
- Shim IPC Process
- DIF
- IPC Process
- Mgmt Agent

IPC API
- Data Transfer
  - SDU Delimiting
  - Data Transfer
  - Relaying and Multiplexing
  - SDU Protection
- Data Transfer Control
  - Transmission Control
  - Retransmission Control
  - Flow Control
- Layer Management
  - CACEP
  - Authentication
  - CDAP Parser/Generator
- RIB
- RIB Daemon
- Enrollment
- Flow Allocation
- Resource Allocation
- Forwarding Table Generator

Increasing timescale (functions performed less often) and complexity
IRATI OS/Linux implementation

Source: S. Vrijders, F. Salvestrini, E. Grasa, M. Tarzan, L. Bergesio, D. Staessens, D. Colle
“Prototyping [RINA], the IRATI project approach”, IEEE Network, March 2014
Host A

Host R

Host B

Shim IPC Process

VLAN 300

Shim DIF ETH VLAN

Shim IPC Process

VLAN 400

IRATI

test1.

IRATI

test2.

IRATI

test3.
Host A

Host B

Host R

VLAN 300

VLAN 400

Shim IPC Process

Shim IPC Process

Shim IPC Process

Normal DIF A

test1. IRATI

test2. IRATI

test3. IRATI

ipcm
Host A

Host R

Host B

Shim IPC Process

Shim IPC Process

Shim IPC Process

Shim IPC Process

VLAN 300

VLAN 400
Shim IPC
Process

Shim IPC
Process

Shim IPC
Process

Shim IPC
Process

Shim IPC
Process

Shim IPC
Process

Shim IPC
Process

Shim IPC
Process

test1.
IRATI

IRATI
test2.

IRATI
test3.

IRATI

Normal DIF A

Normal DIF A

Normal DIF A

Normal DIF A

VLAN 300

VLAN 400
Host A

Host B

Host R

<table>
<thead>
<tr>
<th>Host R</th>
<th>Host B</th>
<th>Host A</th>
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<tbody>
<tr>
<td>rina-echo time server</td>
<td>rina-echo time client</td>
<td>ipcm</td>
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Bootstrapping a RINA network
Data center (DC) network
Example scenario: Customer access DC via the Internet
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Extra information

- RINA workshop
  - 28 January 2015, Ghent Belgium

- IRATI prototype can be found at [https://irati.github.io/stack/](https://irati.github.io/stack/)