Intro

RINASim

Outro

Skip This Paper
RINASim:
Your Recursive InterNetwork Architecture Simulator

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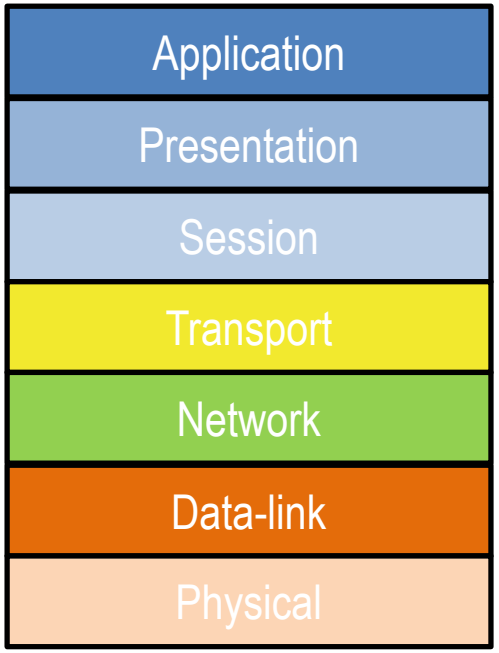
3rd-4th September 2015, Zürich, Switzerland

THEORY

- *Your teachers told you about this…*
  - 1978 – 1994

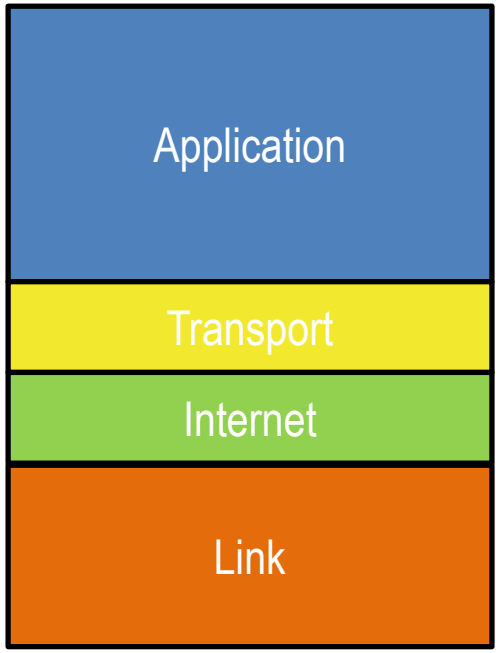
ISO-OSI RM



THEORY

- *…or this…*
  - 1983

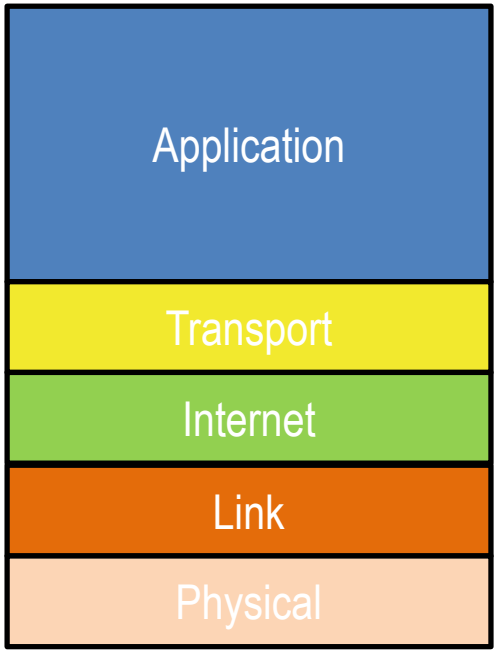
TCP/IP RM



THEORY

- *…or that!*

TCP/IP RM



network part of each application

data transfer services

logical communication

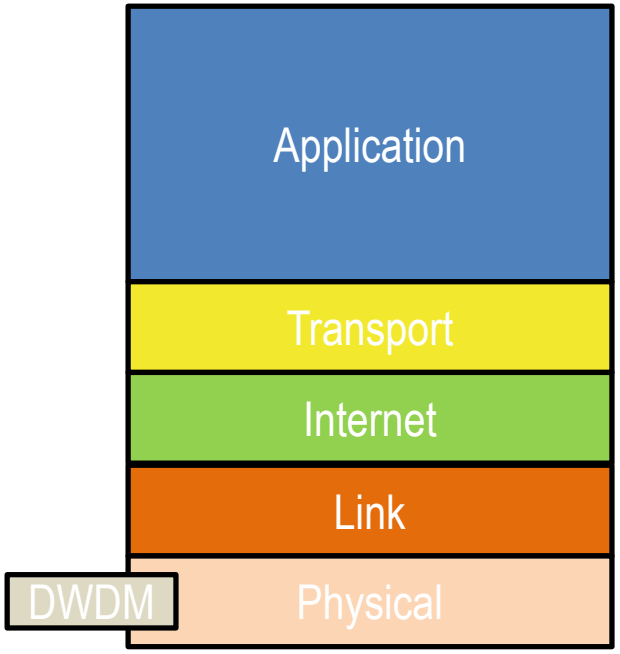
adjacent communication

medium abstraction

THEORY

- *Have you noticed clash of theory and practice?*

TCP/IP RM



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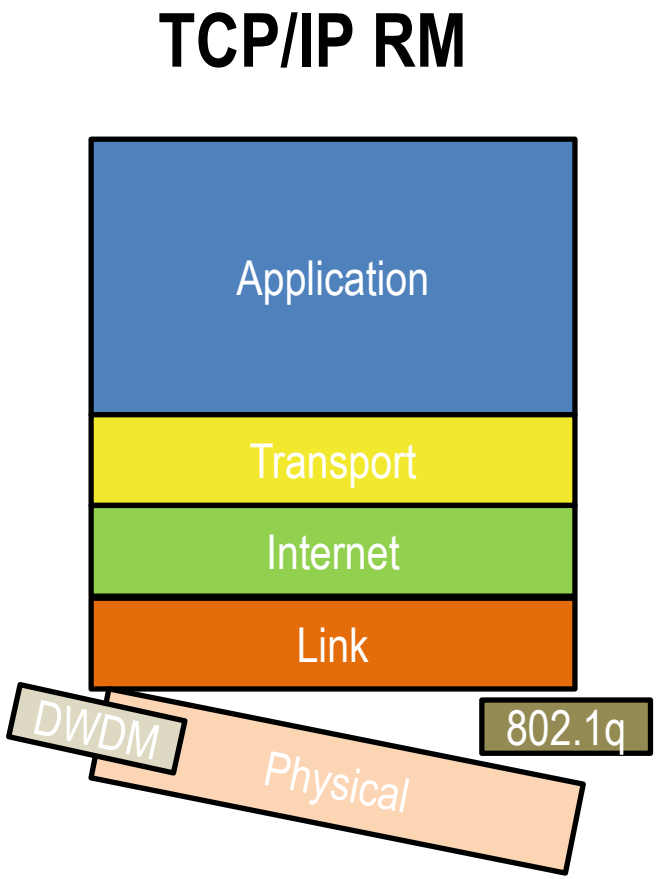

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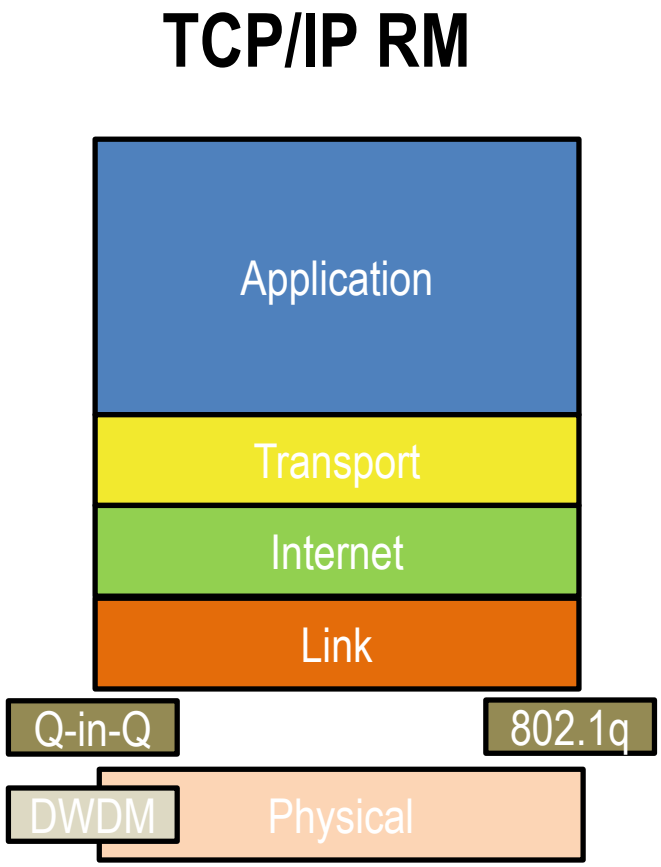

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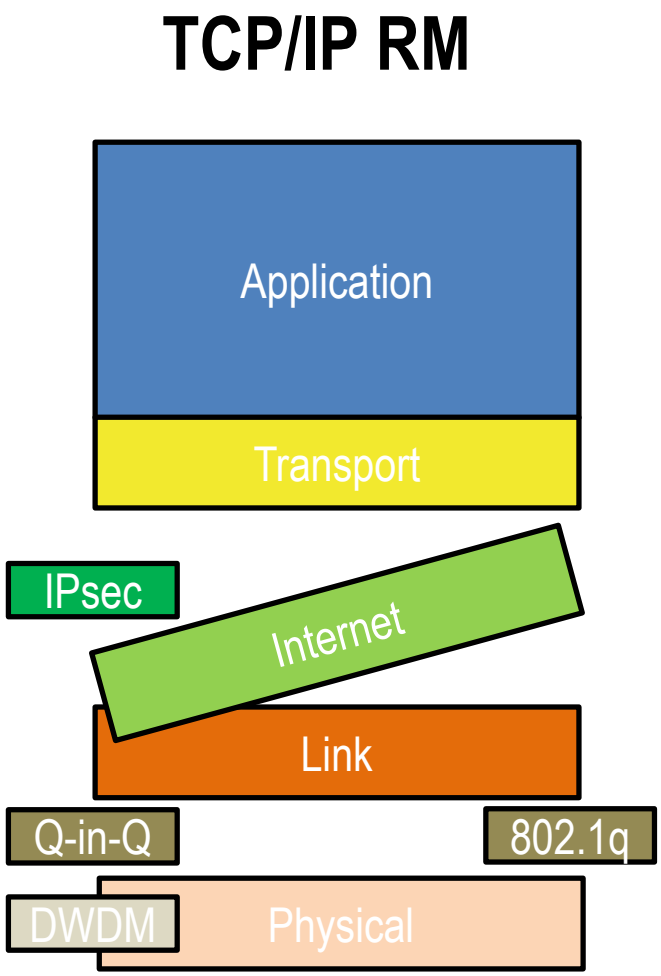

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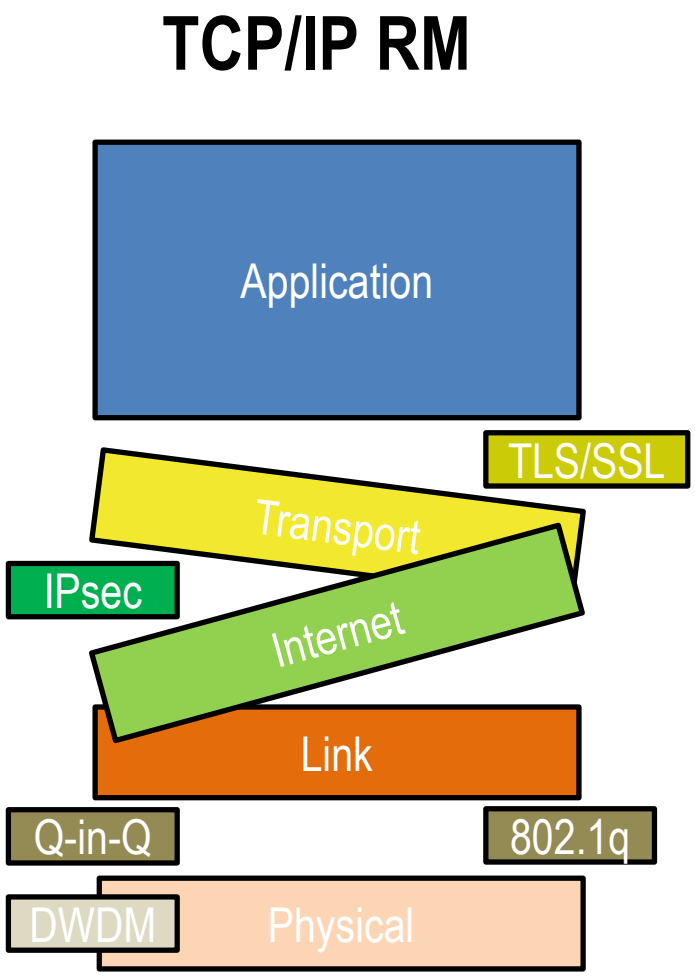

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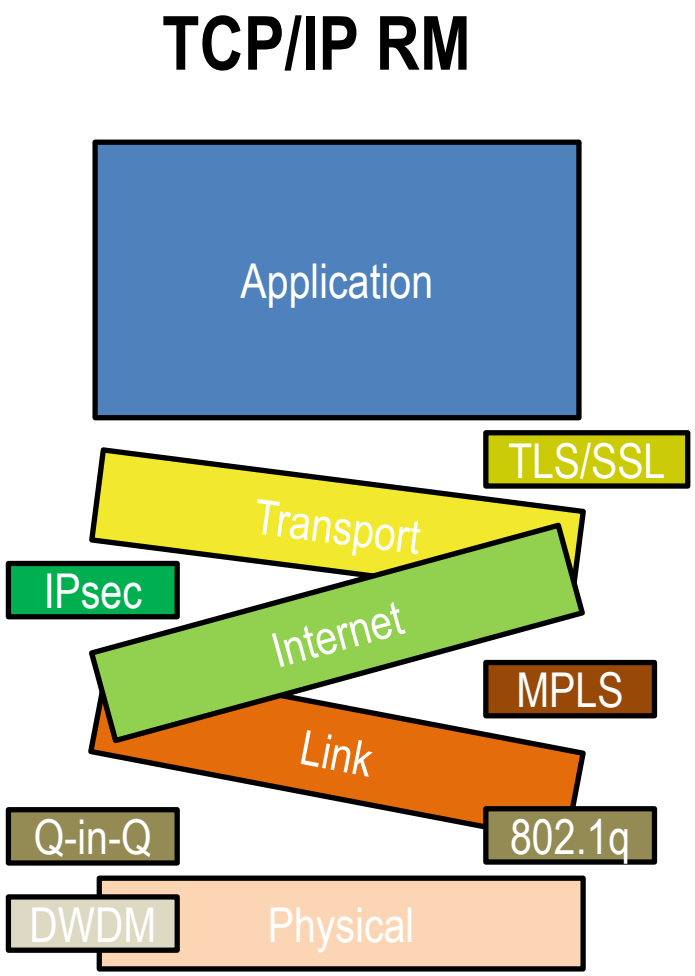

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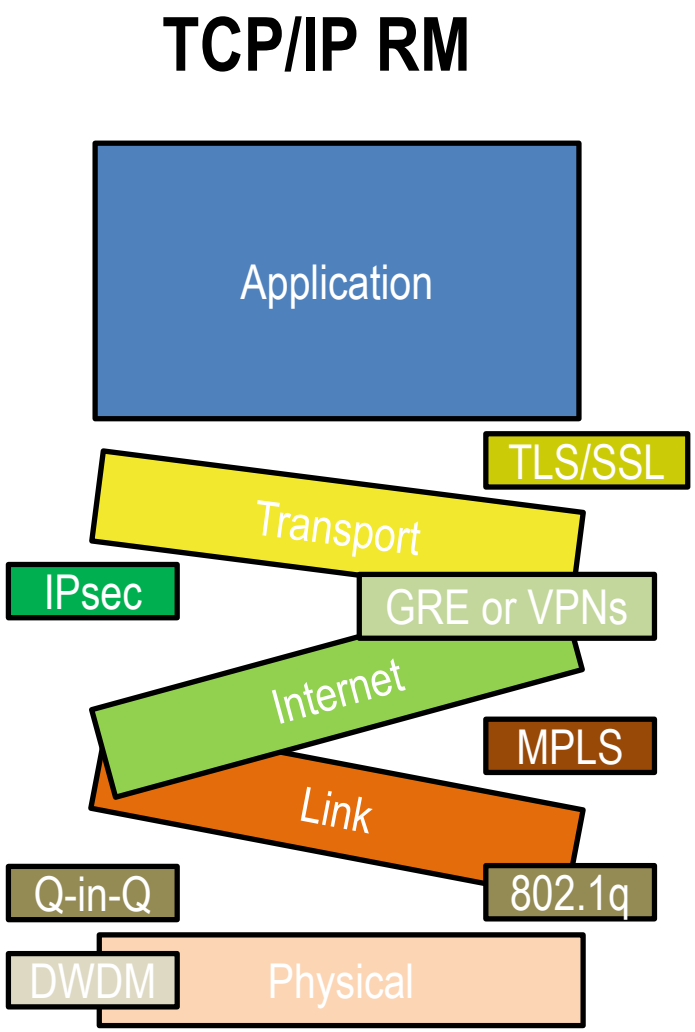

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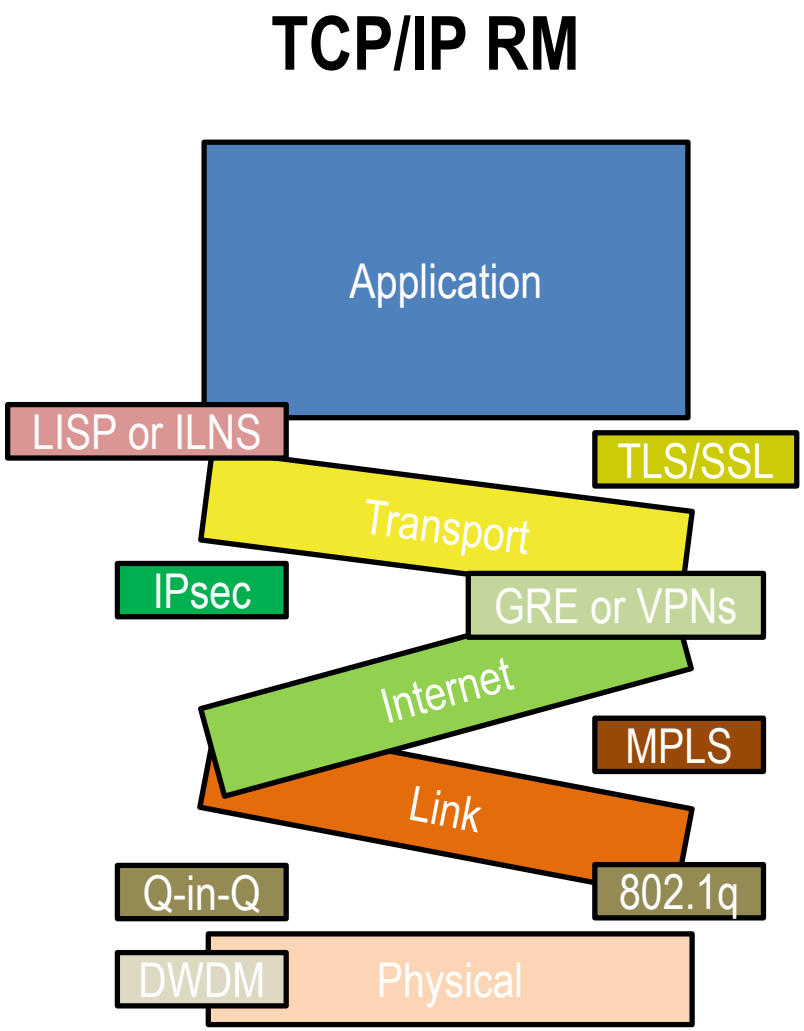

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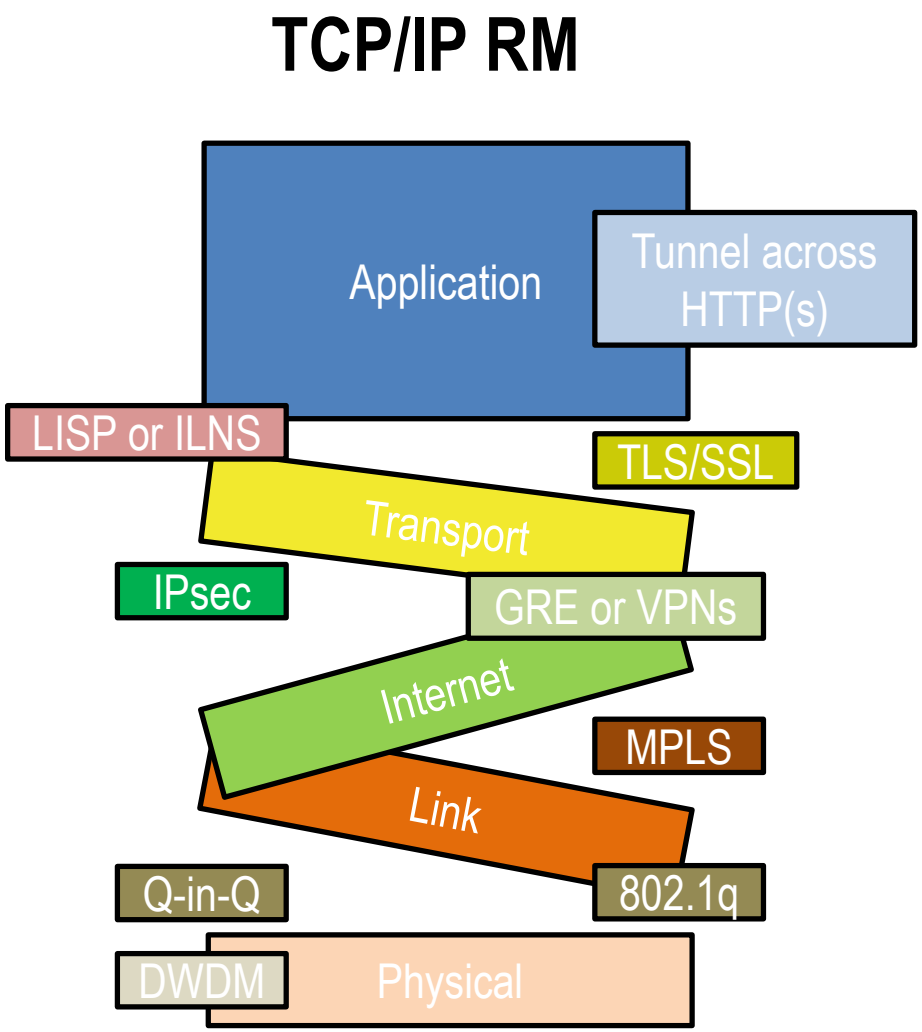
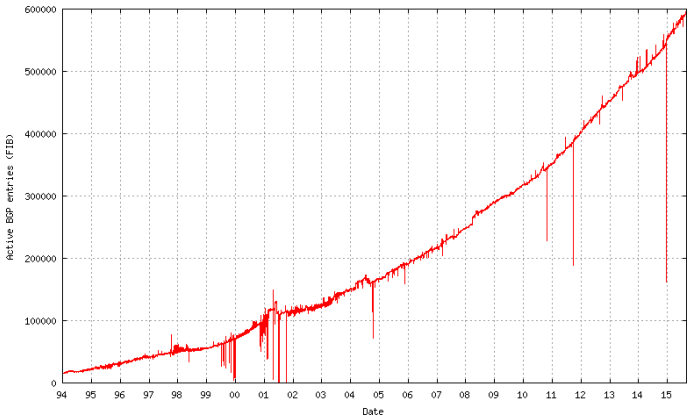
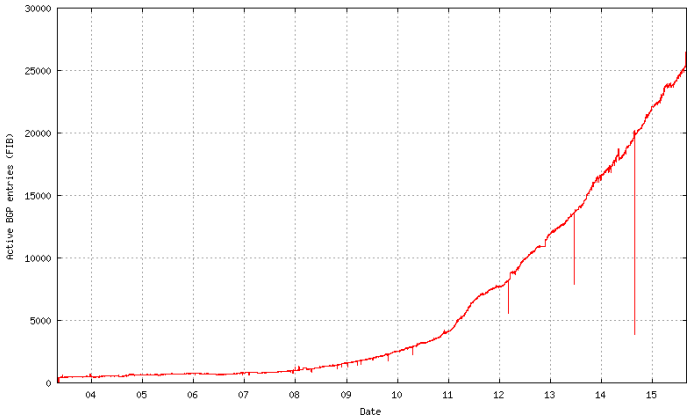


PROBLEMS

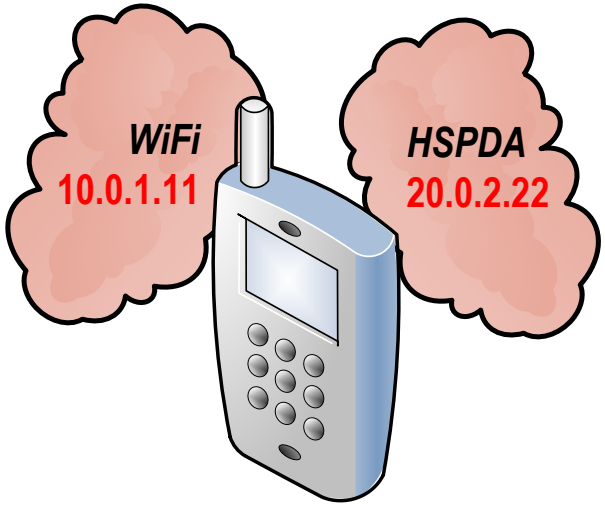


IPv4



IPv6

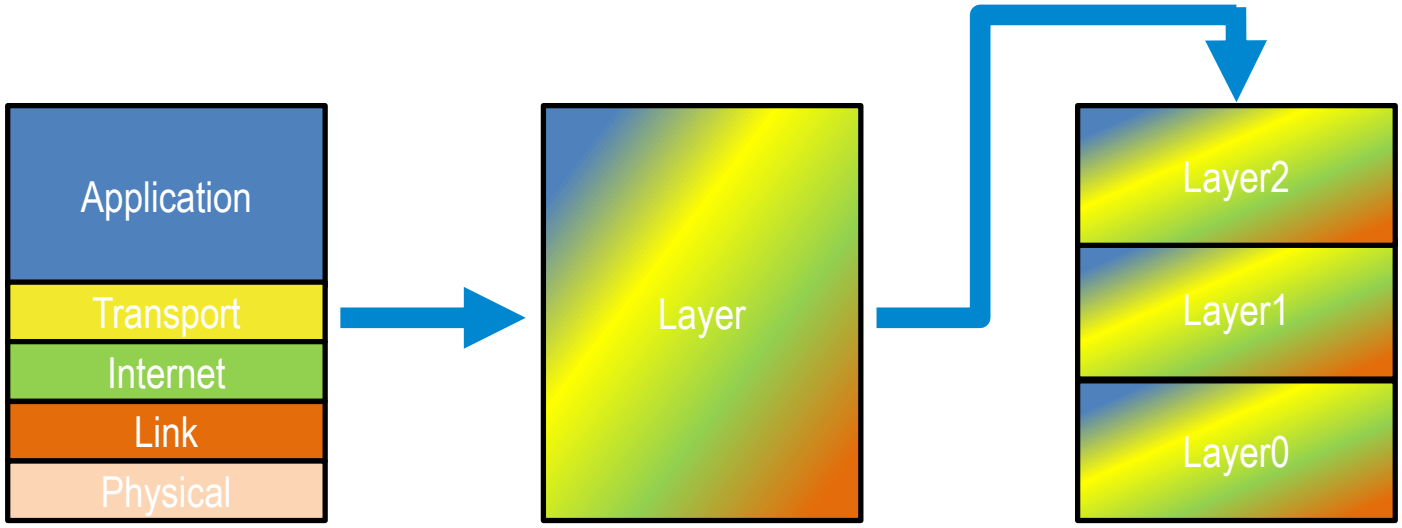
- **Open problems** of nowadays Internet
  - Multi-homing
  - Identity
  - Mobility
  - Default-free Zone growth



What is unique address???

RECURSIVE INTERNETWORK ARCHITECTURE

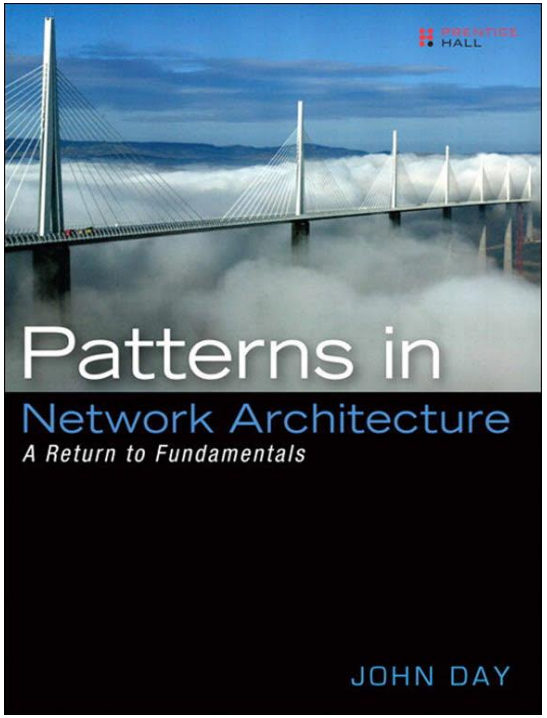
- One generic **layer** (called **DIF**, **Distributed IPC Facilty**) that limits scope



1) Data transfer with soft-state timer-based synchronization
2) Complete addressing and naming scheme
3) Split between mechanism (fixed) and policy (flexible)
4) Single generic application protocol

History

- In 2007 book
  Patterns in Network Architecture: A Return to Fundamentals
  by John Day



GÉANT PROJECT

IRATI
INVESTIGATING RINA

Pristine

1) Soft-State Transport Protocol

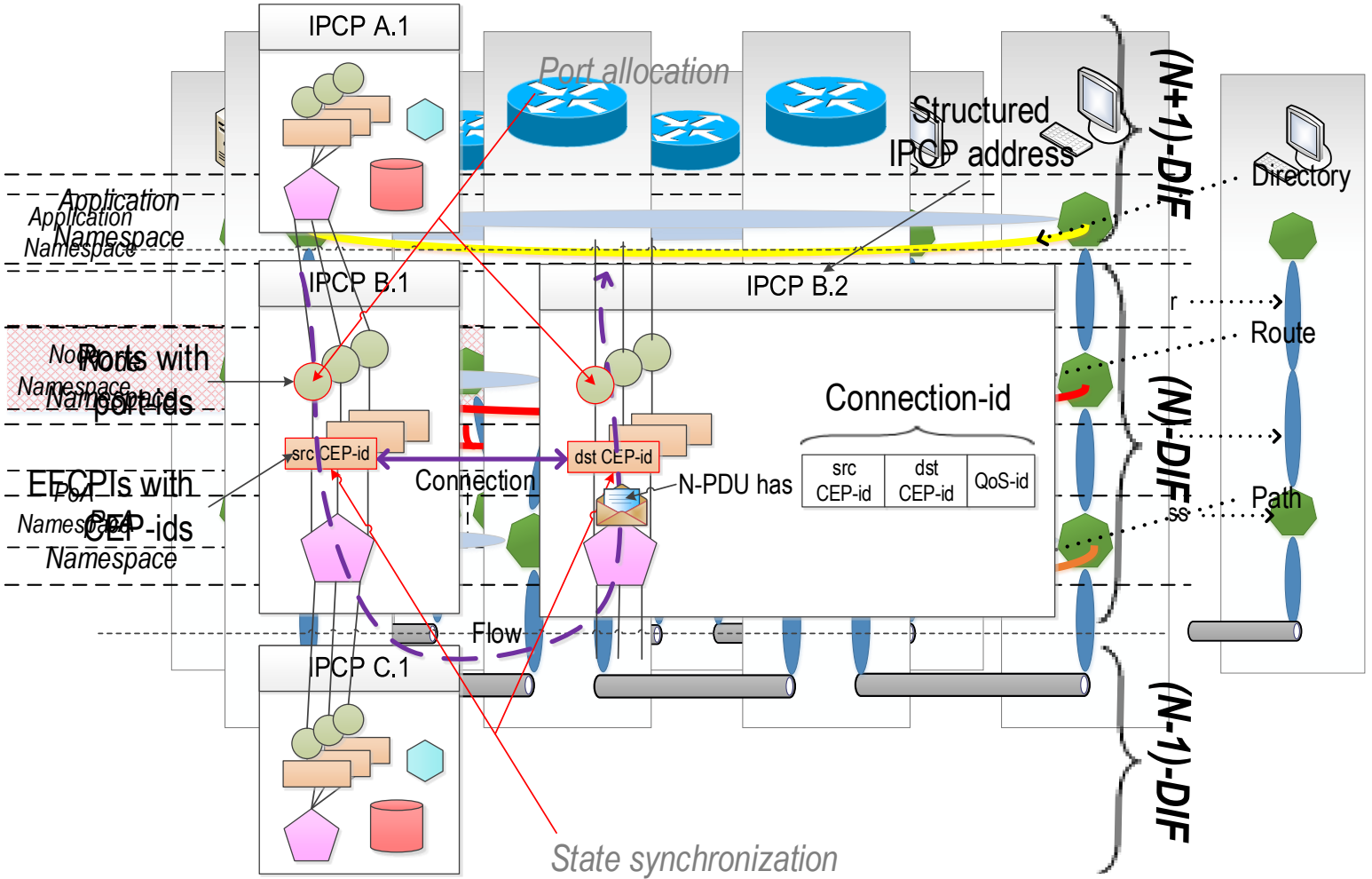
- Hard-state = explicit synchronization prior to communication using special messages (i.e., TCP flags and 3-way handshake)
- **Data Transfer Protocol (DTP)** based on Richard Wattson's transport protocol **Delta-t** from 1984
  - Proves that hard-state is unnecessary IFF
    - **Maximum Packet Lifetime** denotes upper bound time (value MPL) that a packet can exists in a network
    - **Retransmission-timer** specifies maximum period (value R) that a sender is willing to retransmit its unacknowledged messages;
    - **Acknowledgment-timer** defines maximum delay (value A) that the receiver of data can wait before sending acknowledgment.

$$\Delta t = MPL + R + A$$

  - *All connections exist all the time*
    - Decoupling of port allocation from synchronization
    - After period of 2-3 Δt of no traffic, all synchronization state should be discarded, which effectively resets the connection
  - Both reliable and unreliable transfer based on employment of sequence numbers

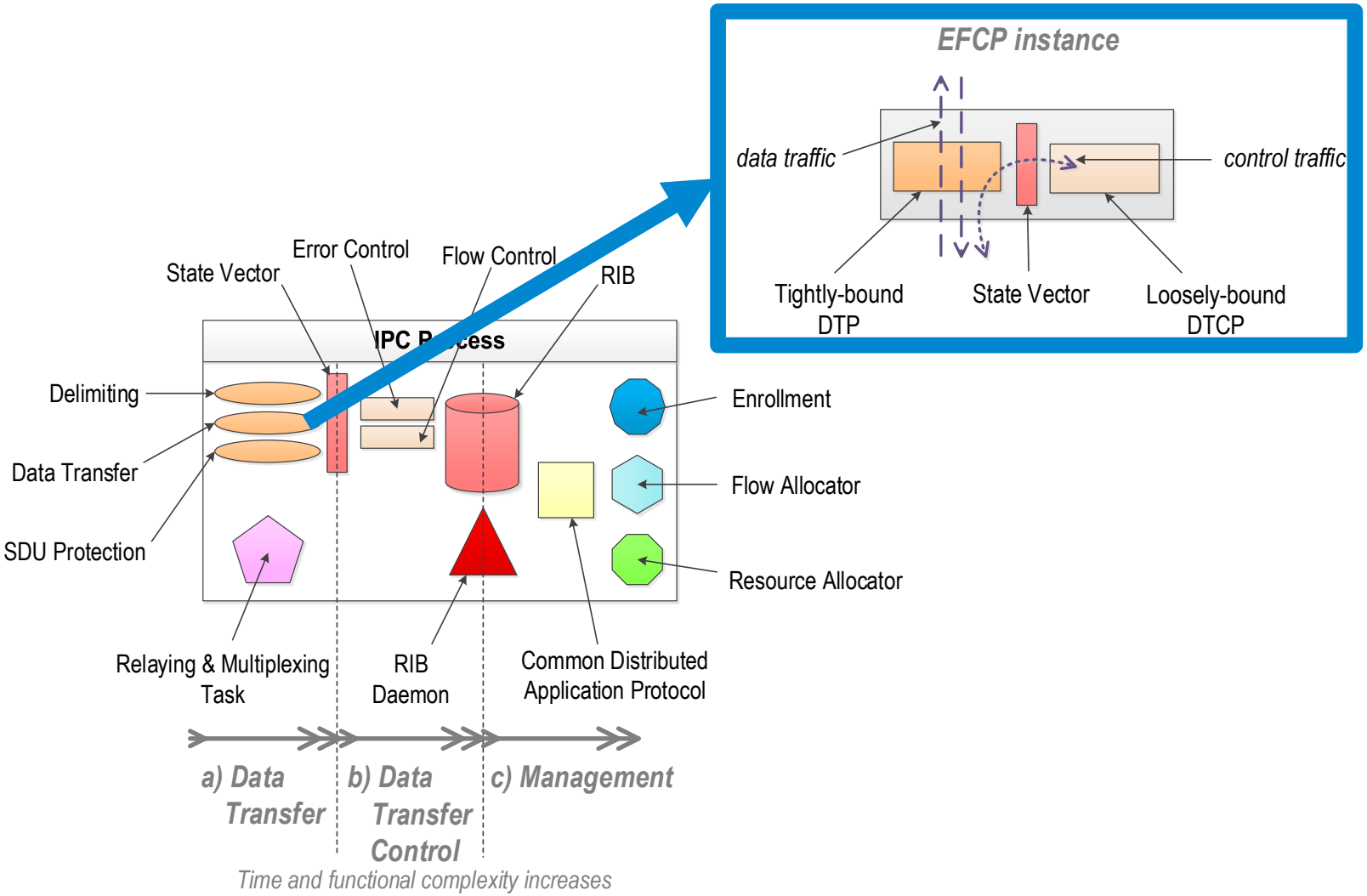
2) Complete Addressing

- Logical vs. Physical addresses
- Variable addresses
- Reflects scope (size) and usage (flat vs. hierarchical)



3) Mechanism vs. Policy

- i.e., error-checking (fixed) employing CRC (flexible)
- Programmable behavior using well-defined APIs

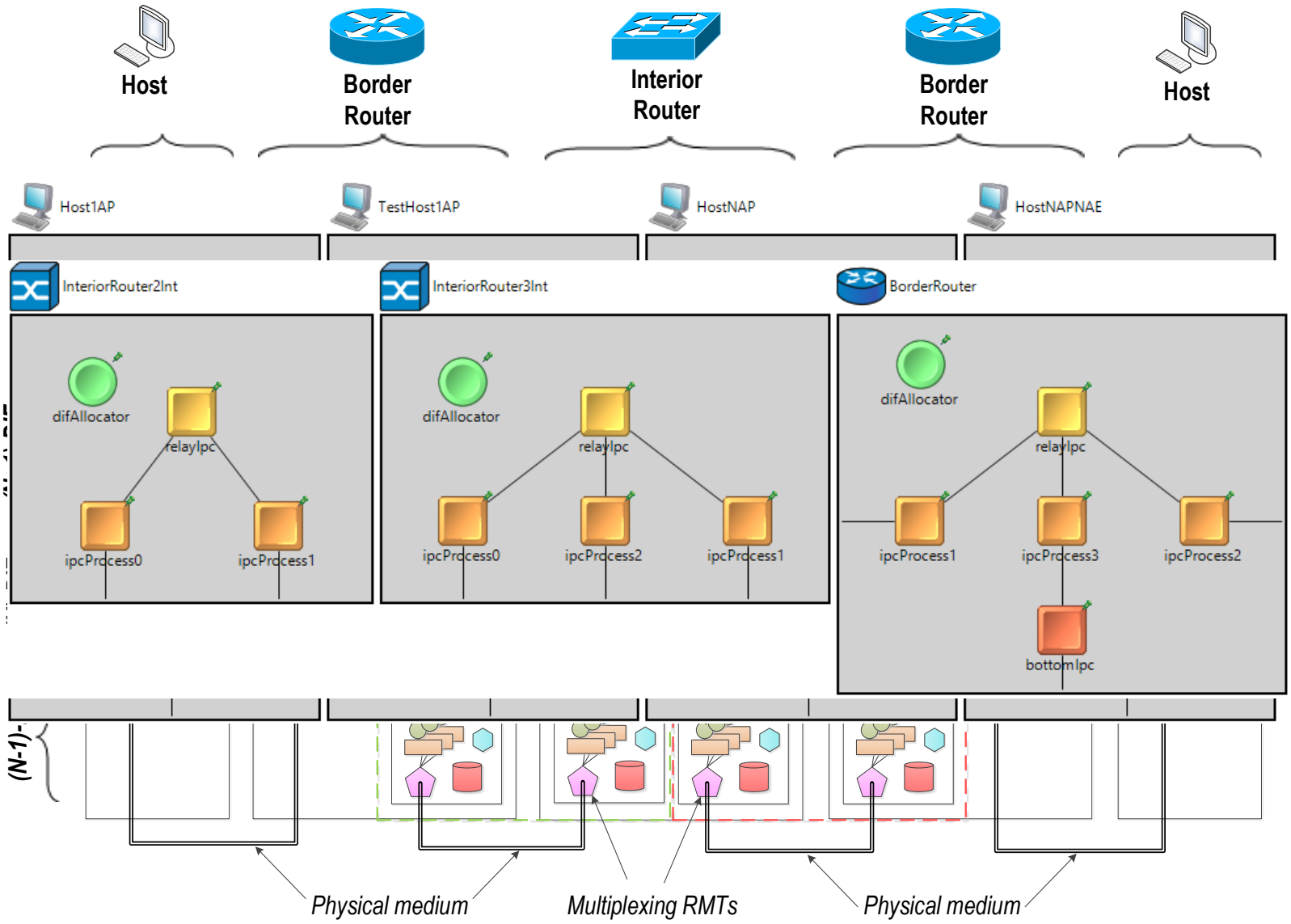


4) CDAP

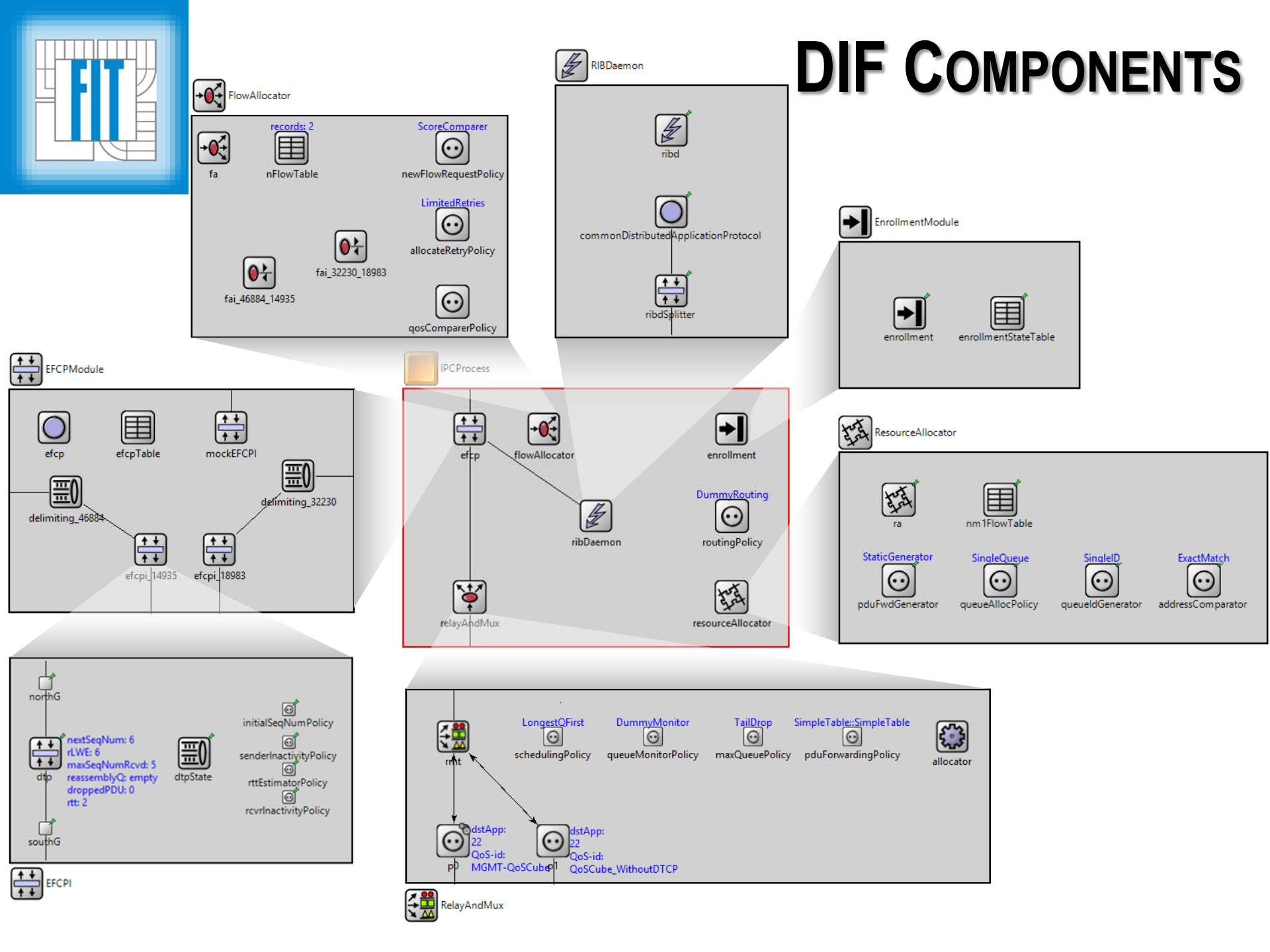
- **Common Distributed Application Protocol (CDAP)**
  - *All application protocols are stateless, the state is in the application*
  - DTP modify state internal to the protocol and CDAP modify state external to the protocol
    - CDAP encapsulated into DTP
  - Request-response scheme with feedback
- Primitive operations governing objects (i.e., files)
  - Read / Write
  - Create / Delete
  - Start / Stop

  } 6 messages × 2 directions = 12 message types
- Subcomponents
  - CACE – connection establishment
  - Auth – authentication
  - CDAppP – protocol operation

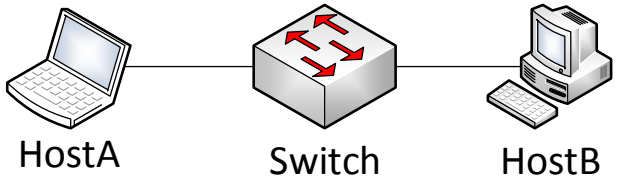
Node Types

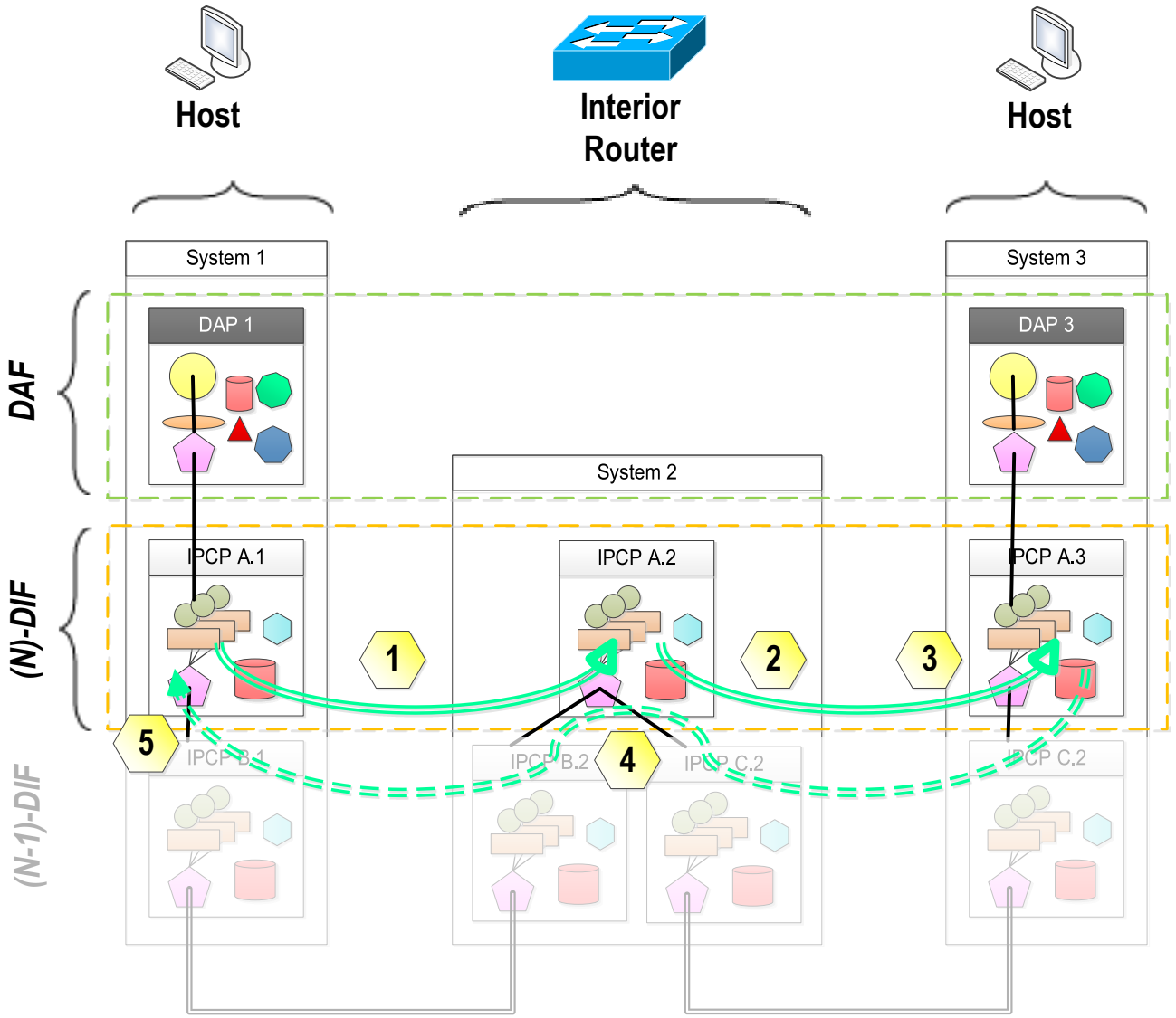

Host
Border Router
Interior Router
Border Router
Host
Host1AP
TestHost1AP
HostNAP
HostNAPNAE
InteriorRouter2Int
InteriorRouter3Int
BorderRouter
difAllocator
relayIpc
ipcProcess0
ipcProcess1
difAllocator
relayIpc
ipcProcess0
ipcProcess2
ipcProcess1
difAllocator
relayIpc
ipcProcess1
ipcProcess3
ipcProcess2
bottomIpc
(N-1)-
Physical medium
Multiplexing RMTs
Physical medium

DIF Components



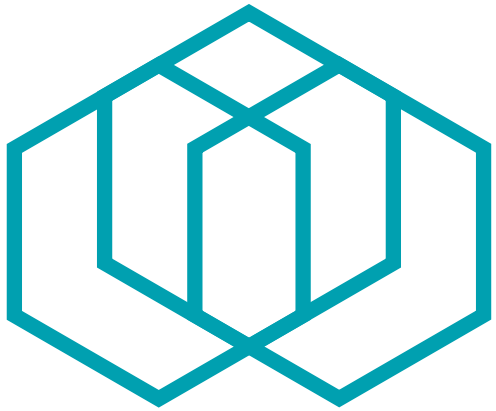
LIVE DEMONSTRATION





Conclusion

- RINASim is full-fledged RINA simulating framework
  - Independent on other libraries (such as INET)
  - 105 899 SLOC and getting bigger
    - including *.h, *.cc, *.msg, *.ned, *.ini, *.xml
    - excluding comments and empty lines
- Complete recursive stack implementation
  - Generic CDAP socket-like APIs
  - Data transfer protocol
  - Routing protocol policies
  - Flow lifecycle



RINASim

The End

- *Thank you! Feel free to ask any question…*

- https://github.com/kvetak/RINA
  - Expecting first research papers to be accepted
  - Work more on Enrollment, EFCP
  - Develop a new routing protocols with load-balancing features
  - 4th International RINA Workshop in April 2016 hosted in Brno

- https://github.com/kvetak/ANSA
  - Submit a new INET3.0 contributions
    - EIGRP
    - LISP
    - VRRP
    - TRILL and IS-IS