Arhitecturi Paralele
One BIG Distributed System

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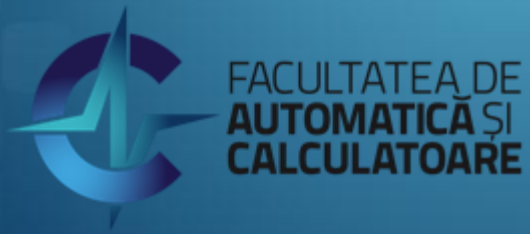
Elemente preluate din cursul Prof. Ciprian Dobre

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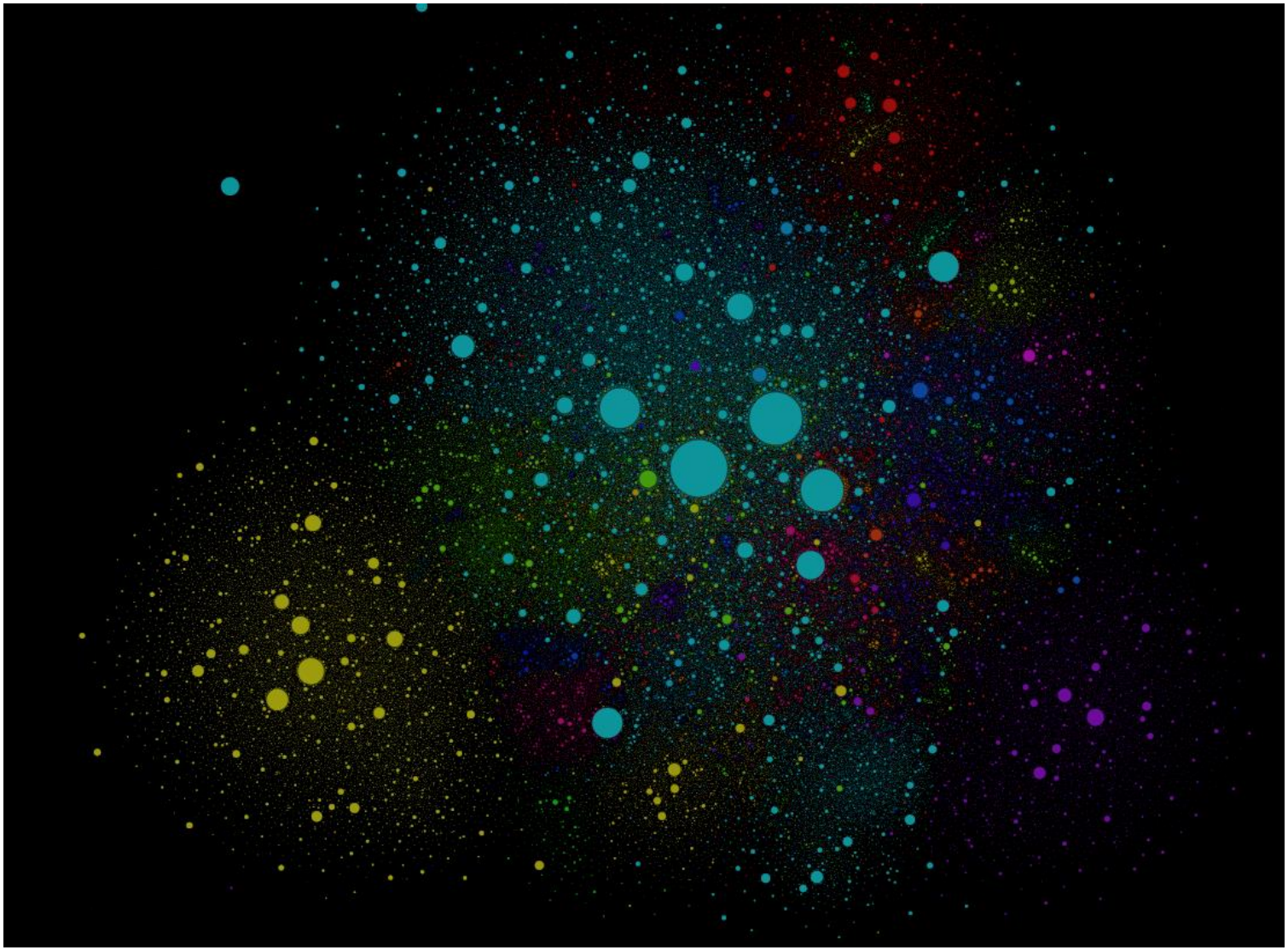
Care este cel mai mare sistem distribuit?

Care este cel mai mare sistem distribuit?



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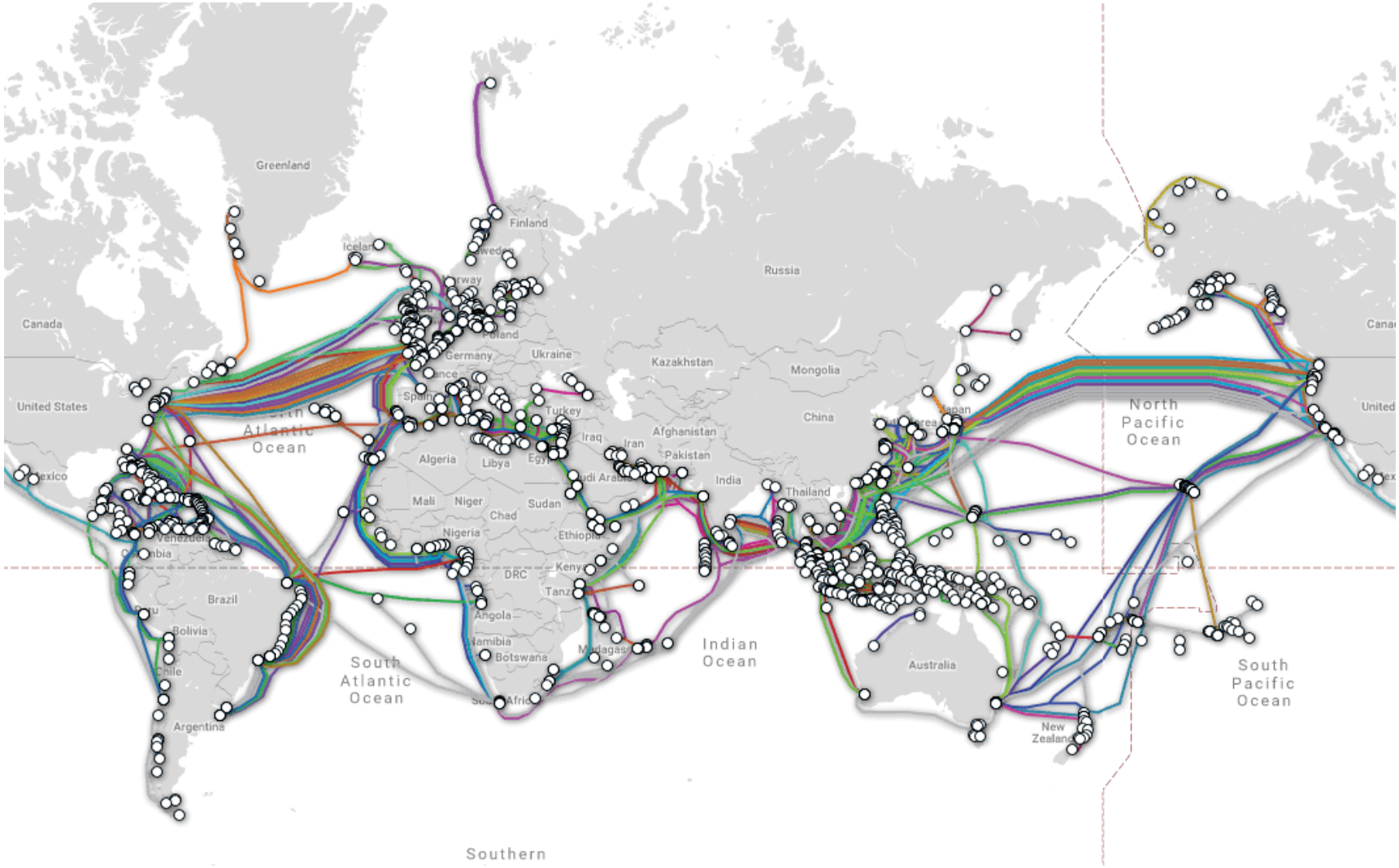

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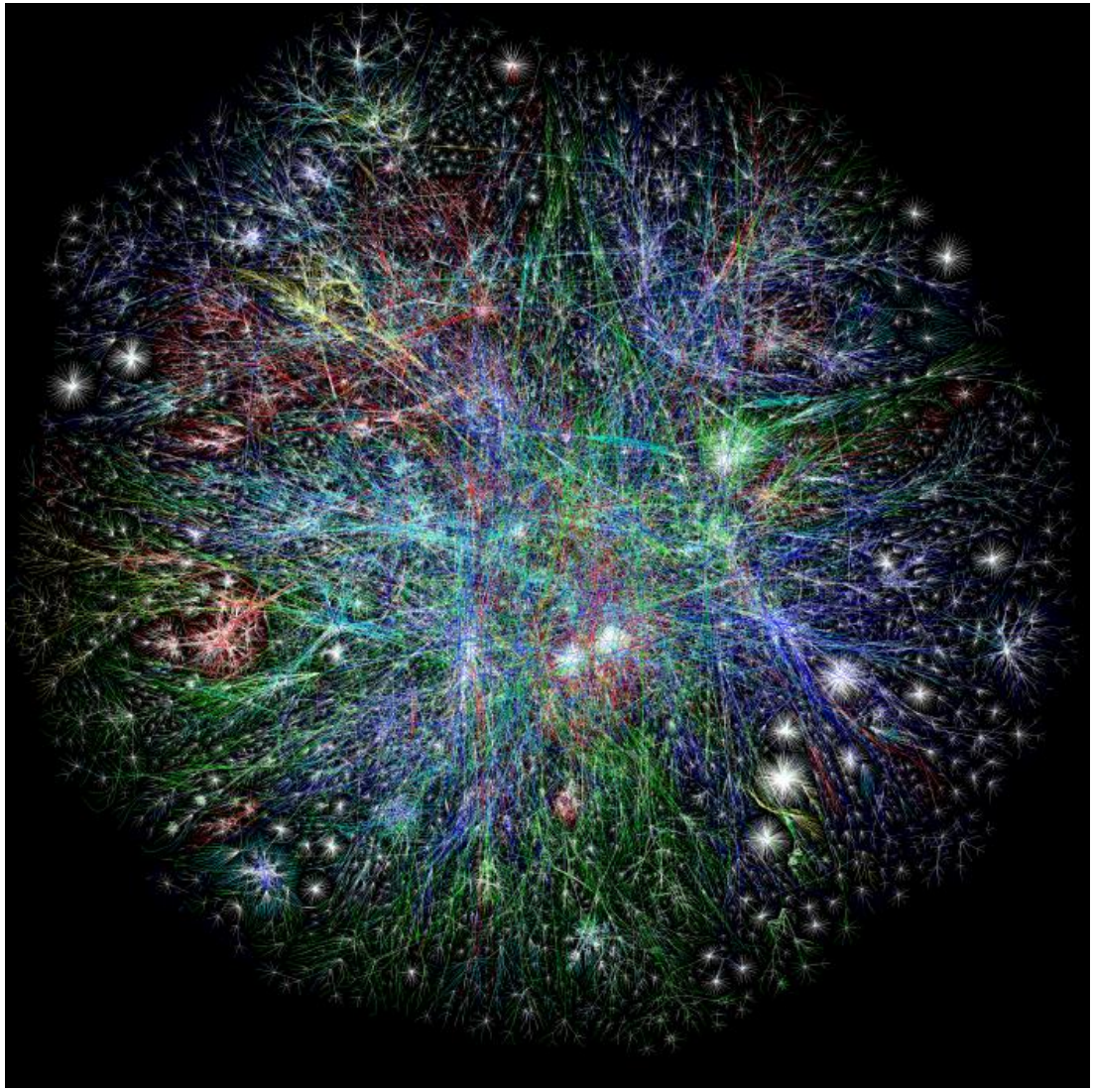


Care este cel mai mare sistem distribuit?

Care este cel mai mare sistem distribuit?

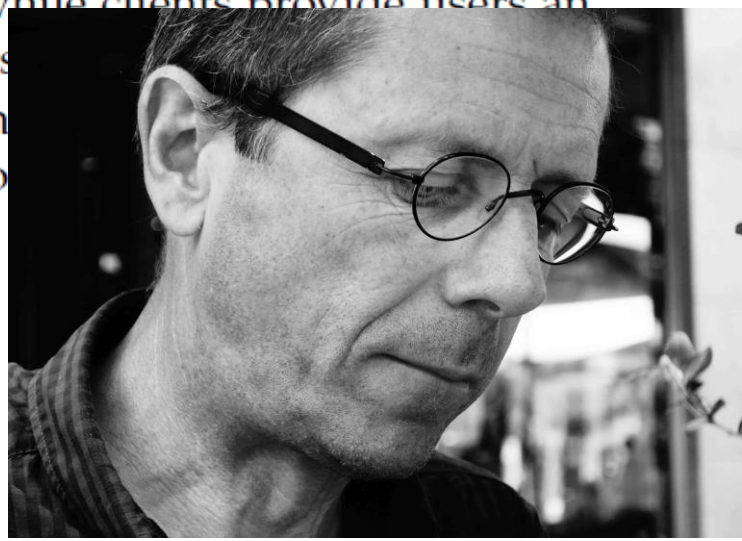
Care este cel mai mare sistem distribuit?

The INTERNET

Distributed Systems – The INTERNET

DISTRIBUTED WEB-BASED SYSTEMS

The World Wide Web (**WWW**) can be viewed as a huge distributed system consisting of millions of clients and servers for accessing linked documents. Servers maintain collections of documents, while clients provide users an ...use interface for presenting and access... ...Web started as a project at CERN, th... ...ory in Geneva, to let its large and geo...



Who made The internet?

Who made The internet? - Vint Cerf

A Protocol for Packet Network Intercommunication

VINTON G. CERF AND ROBERT E. KAHN,
MEMBER, IEEE

Abstract — A protocol that supports the sharing of resources that exist in different packet switching networks is presented. The protocol provides for variation in individual network packet sizes, transmission failures, sequencing, flow control, end-to-end error checking, and the creation and destruction of logical process-to-process connections. Some implementation issues are considered, and problems such as internetwork routing, accounting, and timeouts are exposed.

INTRODUCTION

IN THE LAST few years considerable effort has been expended on the design and implementation of packet switching networks [1]-[7],[14],[17]. A principle reason for developing such networks has been to facilitate the sharing of computer resources. A packet communication network includes a transportation mechanism for delivering data between computers or between computers and terminals. To make the data meaningful, computer and terminals

of one or more *packet sw*
communication media th
switches. Within each H
exist *processes* which
processes in their own o
definition of a process
purposes [13]. These pr
ultimate source and de
network. Typically, with
there exists a protocol fo
any source and destinatio
and destination processes
convention for commu
Processes in two distinct
use different protocols
ensemble of packet swi
media is called the *pack*

OSI stack?

OSI stack?

OSI Model				
Layer			Protocol data unit (PDU)	Function[3]
Host layers	7	Application	Data	High-level APIs, including resource sharing, remote file access
	6	Presentation		Translation of data between a networking service and an application; including character encoding, data compression and encryption/decryption
	5	Session		Managing communication sessions, i.e. continuous exchange of information in the form of multiple back-and-forth transmissions between two nodes
	4	Transport	Segment, Datagram	Reliable transmission of data segments between points on a network, including segmentation, acknowledgement and multiplexing
Media layers	3	Network	Packet	Structuring and managing a multi-node network, including addressing, routing and traffic control
	2	Data link	Frame	Reliable transmission of data frames between two nodes connected by a physical layer
	1	Physical	Symbol	Transmission and reception of raw bit streams over a physical medium

TCP/IP stack?

TCP/IP stack?

OSI	TCP/IP
Application	
Presentation	
Session	Data
Transport	TCP
Network	IP
Data link	Ethernet
Physical	Cupru

TCP/IP stack garanții?

OSI	TCP/IP	Garanții
Application		
Presentation		
Session	Data (HTTP)	
Transport	TCP	
Network	IP	
Data link	Ethernet	
Physical	Cupru	Mesajul e transmis

TCP/IP stack garanții?

OSI	TCP/IP	Garanții
Application		
Presentation		
Session	Data (HTTP)	
Transport	TCP	
Network	IP	
Data link	Ethernet	Best efort ca mesajul să ajungă unde trebuie în rețea
Physical	Cupru	Mesajul e transmis

TCP/IP stack garanții?

OSI	TCP/IP	Garanții
Application		
Presentation		
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Network	IP	Best efort ca mesajul să ajungă unde trebuie în Internet
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TCP/IP stack garanții?

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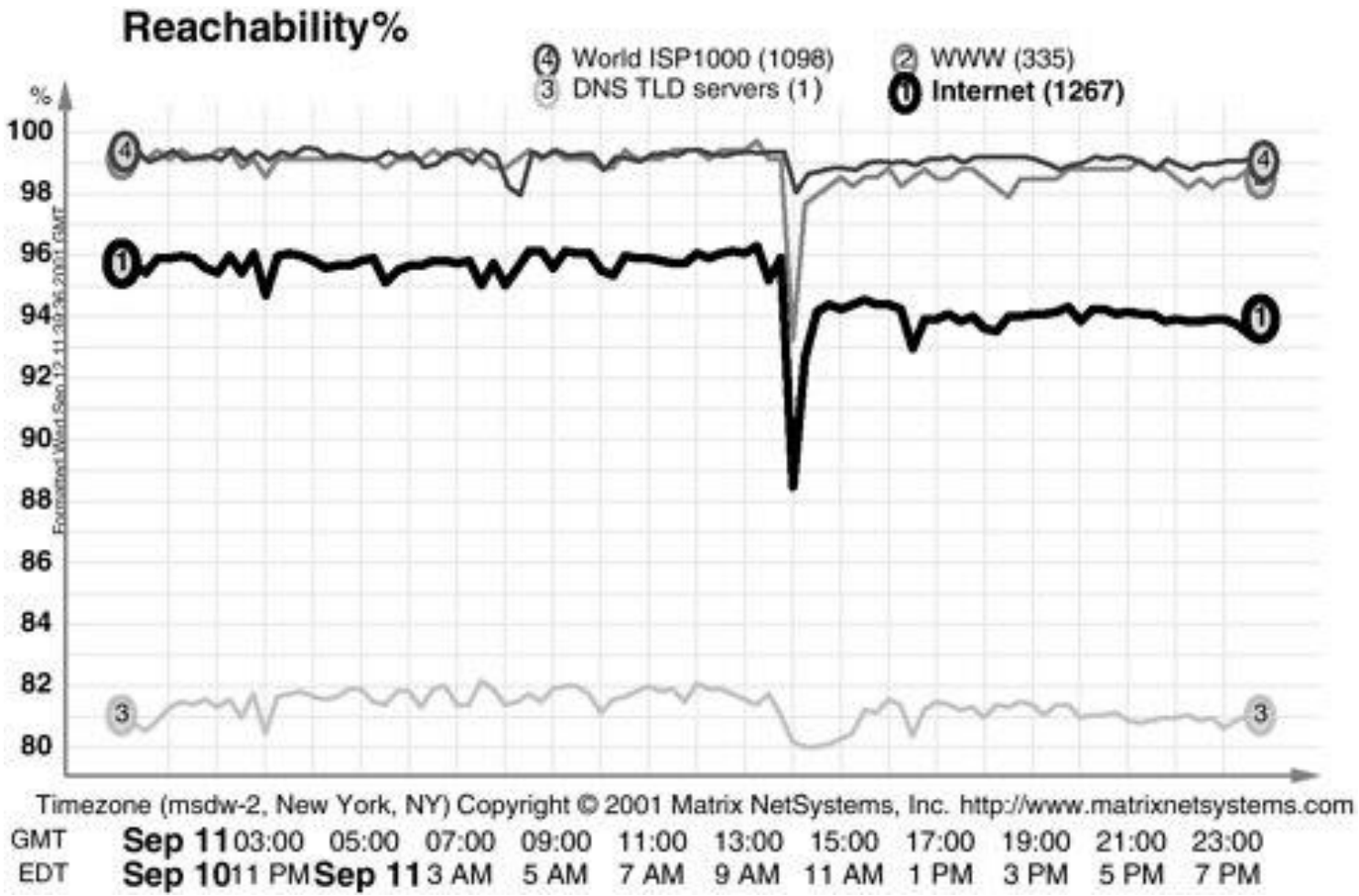
Physical	Cupru	Mesajul e transmis

TCP/IP stack garanții?

OSI	TCP/IP	Garanții
Application		
Presentation		
Session	Data (HTTP)	Mesajul va fi înțeles de server/browser
Transport	TCP	Mesajul ajunge unde trebuie
Network	IP	Best efort ca mesajul să ajungă unde trebuie în Internet
Data link	Ethernet	Best efort ca mesajul să ajungă unde trebuie în rețea
Physical	Cupru	Mesajul e transmis

Deci cât de bun e internetul ca sistem distribuit?

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Who invented Ethernet?

Who invented Ethernet? - Robert Metcalfe

Computer Systems

G. Bell, S. Fuller and D. Siewiorek, Editors

Ethernet: Distributed Packet Switching for Local Computer Networks

Robert M. Metcalfe and David R. Boggs
Xerox Palo Alto Research Center

Ethernet is a branching broadcast communication system for carrying digital data packets among locally distributed computing stations. The packet transport mechanism provided by Ethernet has been used to build systems which can be viewed as either local computer networks or loosely coupled multiprocessors. An Ethernet's shared communication facility, its Ether, is a pas-

1. Background

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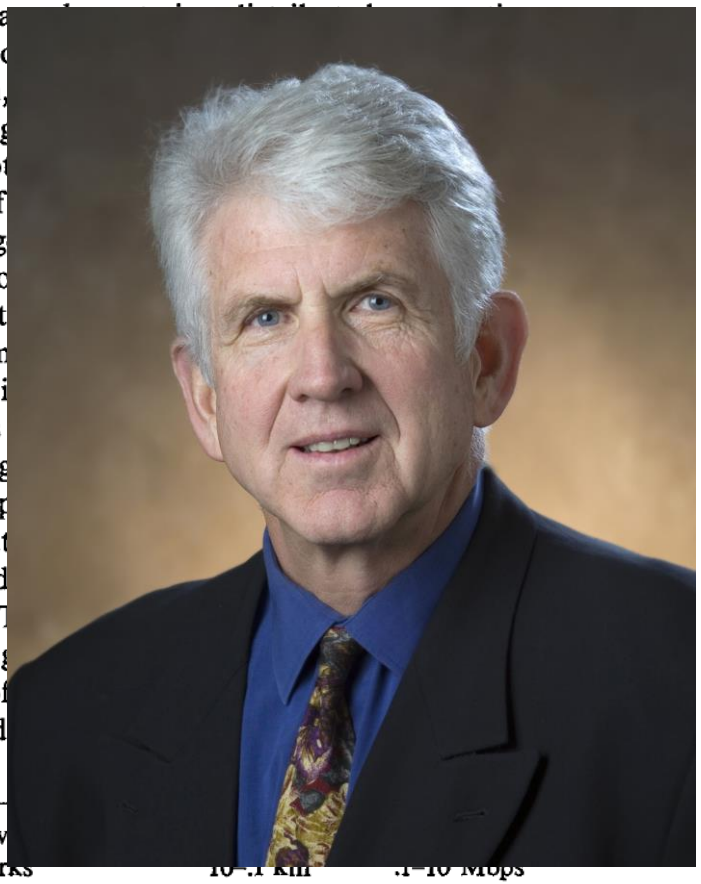
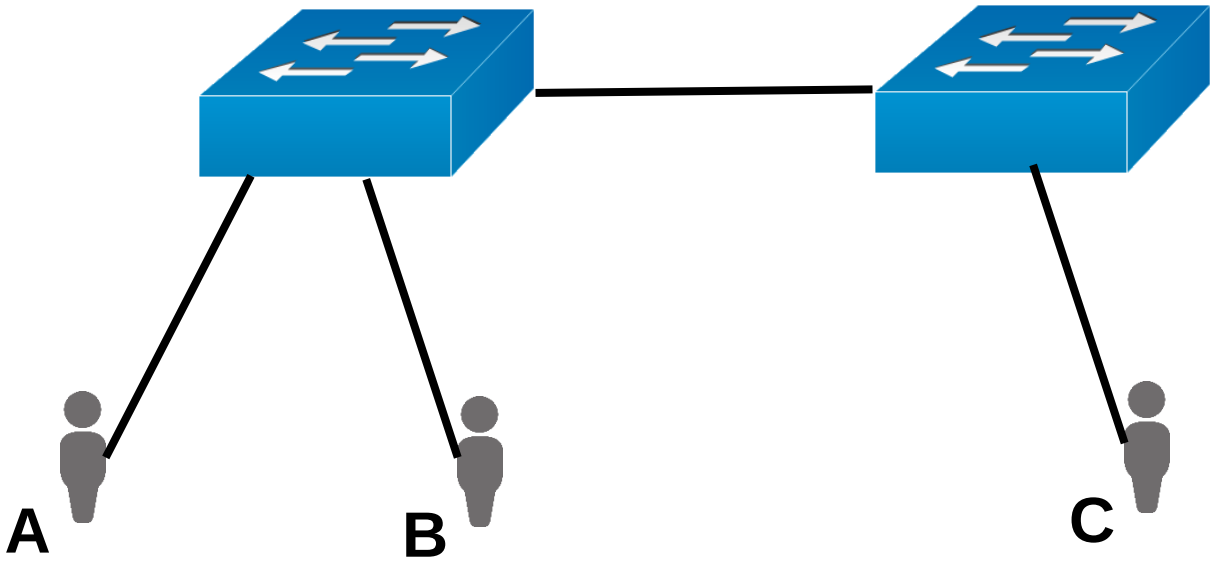


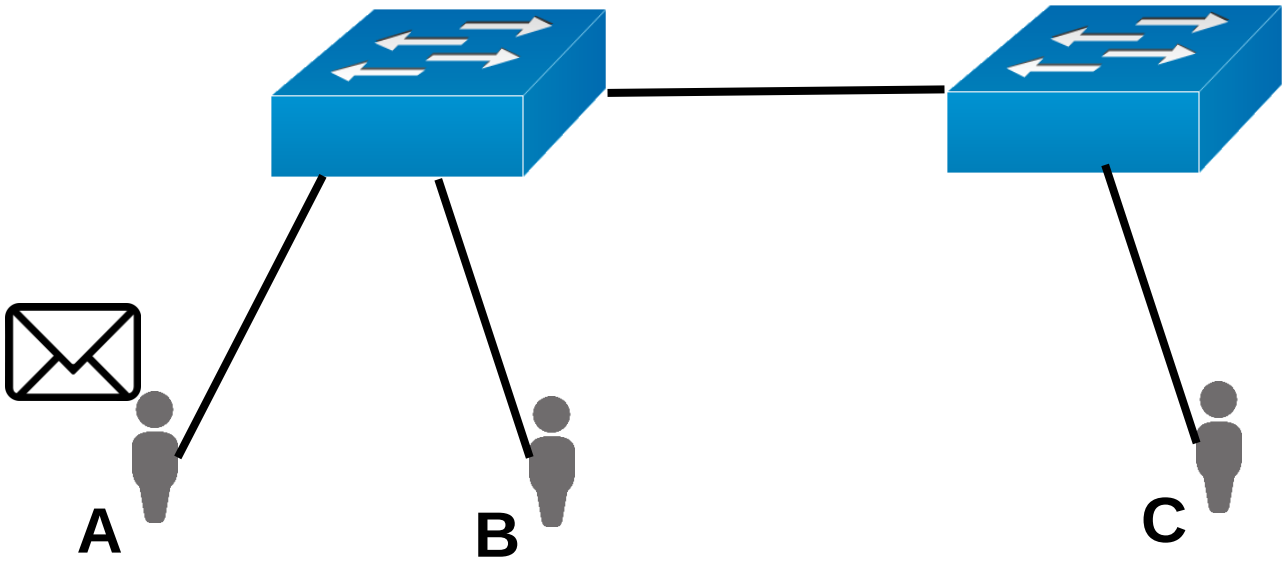
Activity		
Remote netw		
Local networks	.1–10 km	1–10 Mbps
Multiprocessors	< .1 km	> 10 Mbps

1.1 Remote Computer Networking

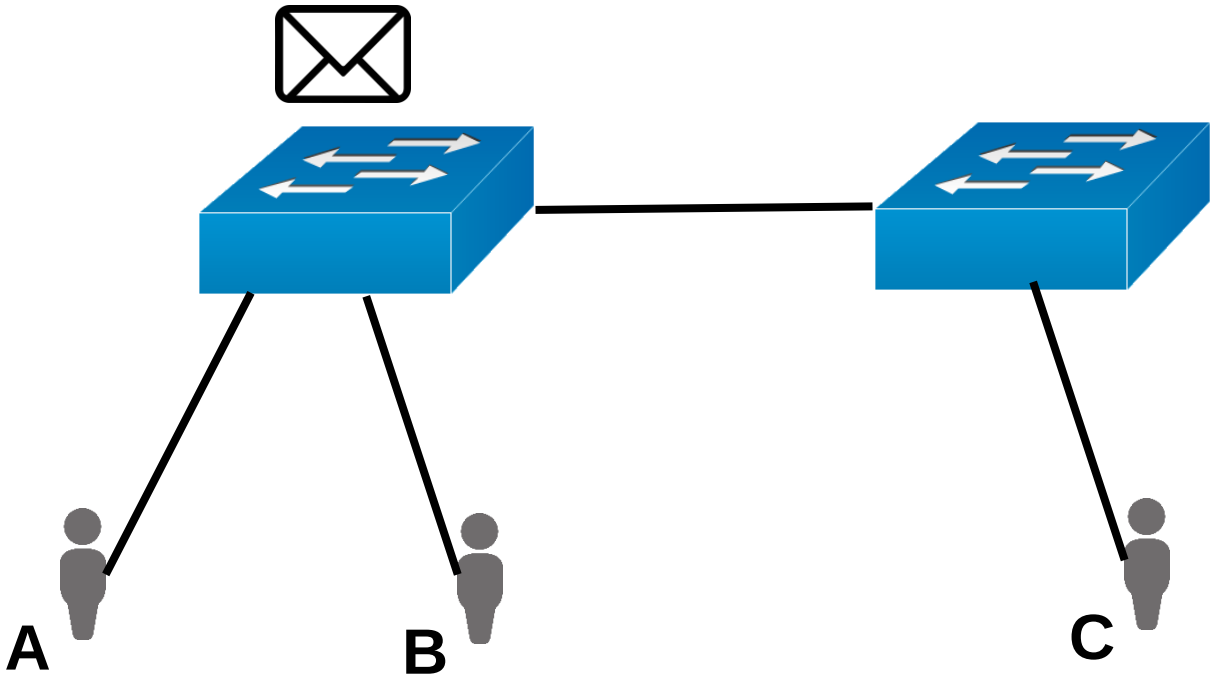
Ethernet – CAM table



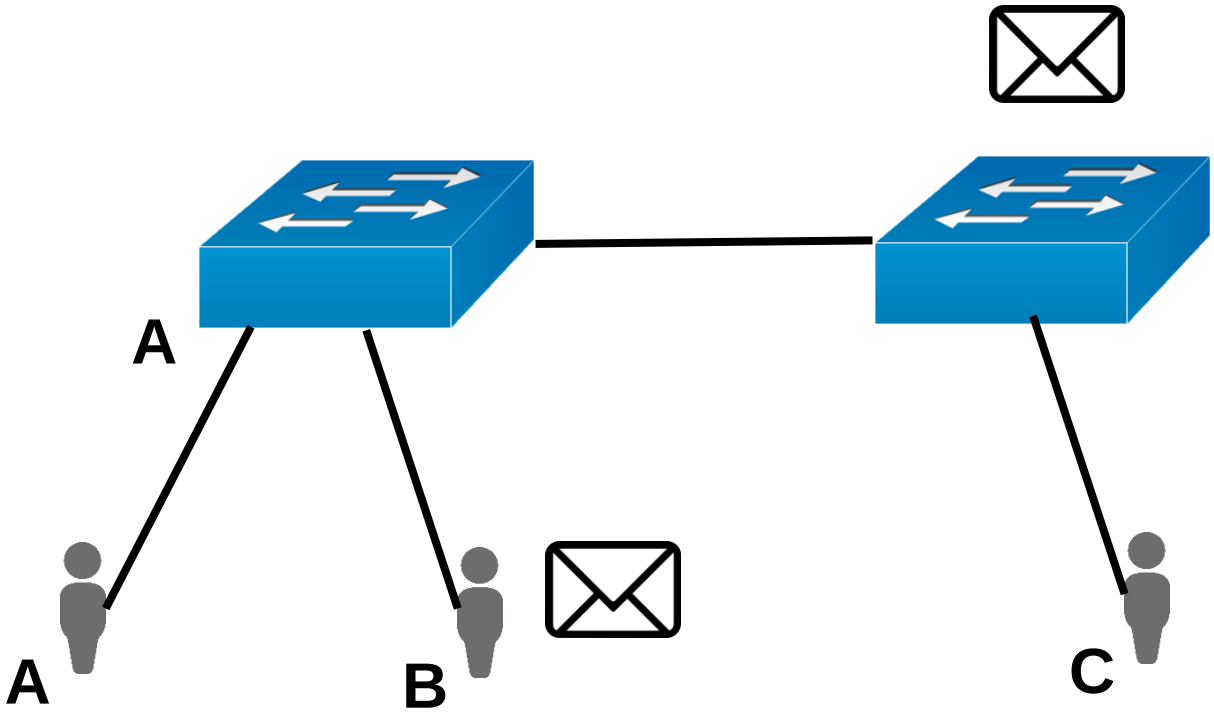
Ethernet – CAM table



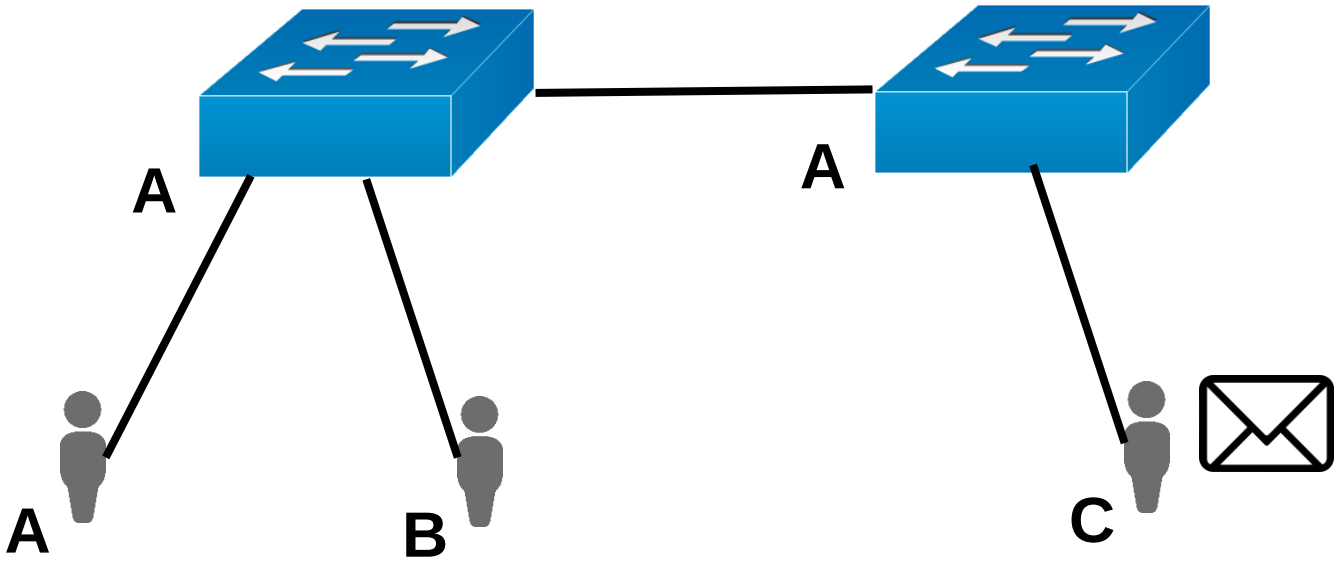
Ethernet – CAM table



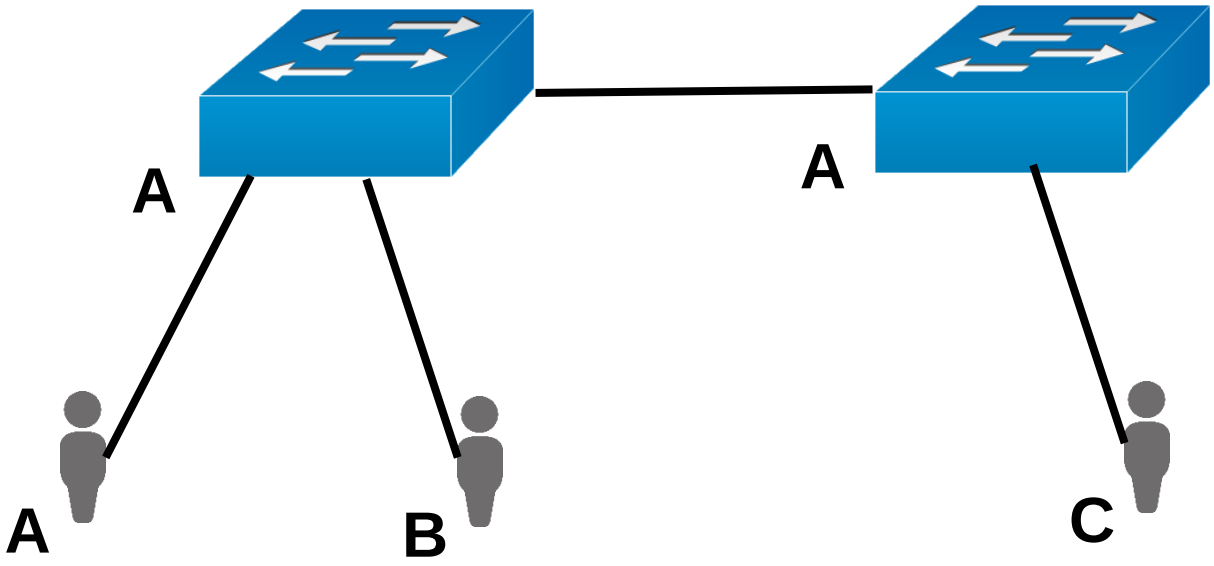
Ethernet – CAM table



Ethernet – CAM table



Ethernet – CAM table



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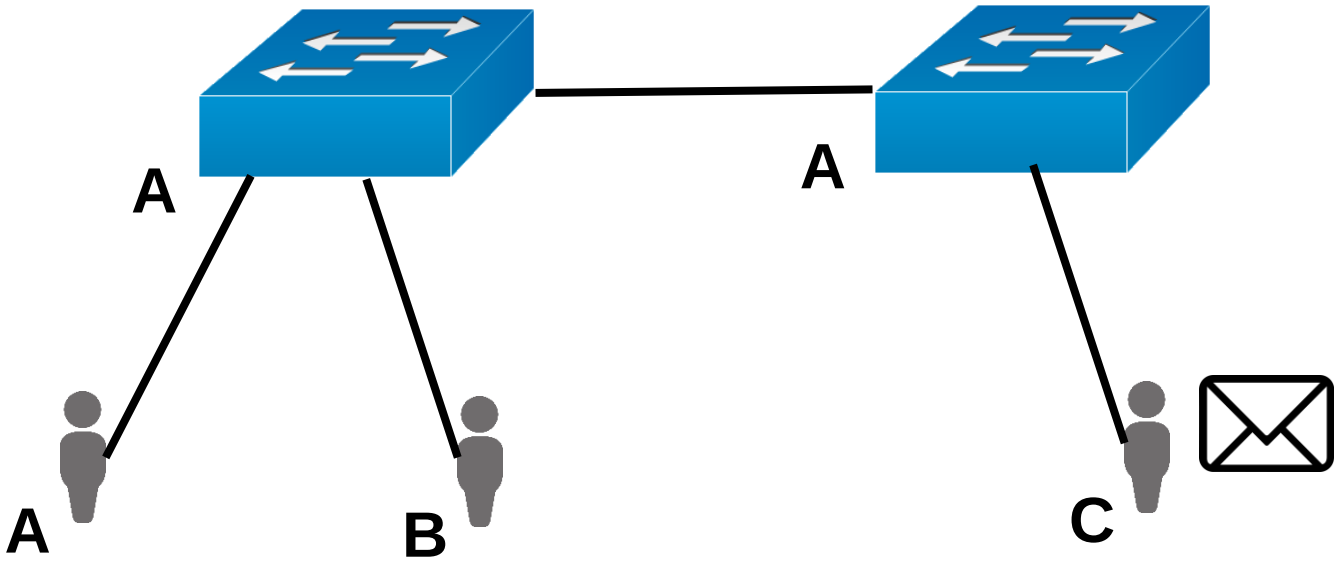

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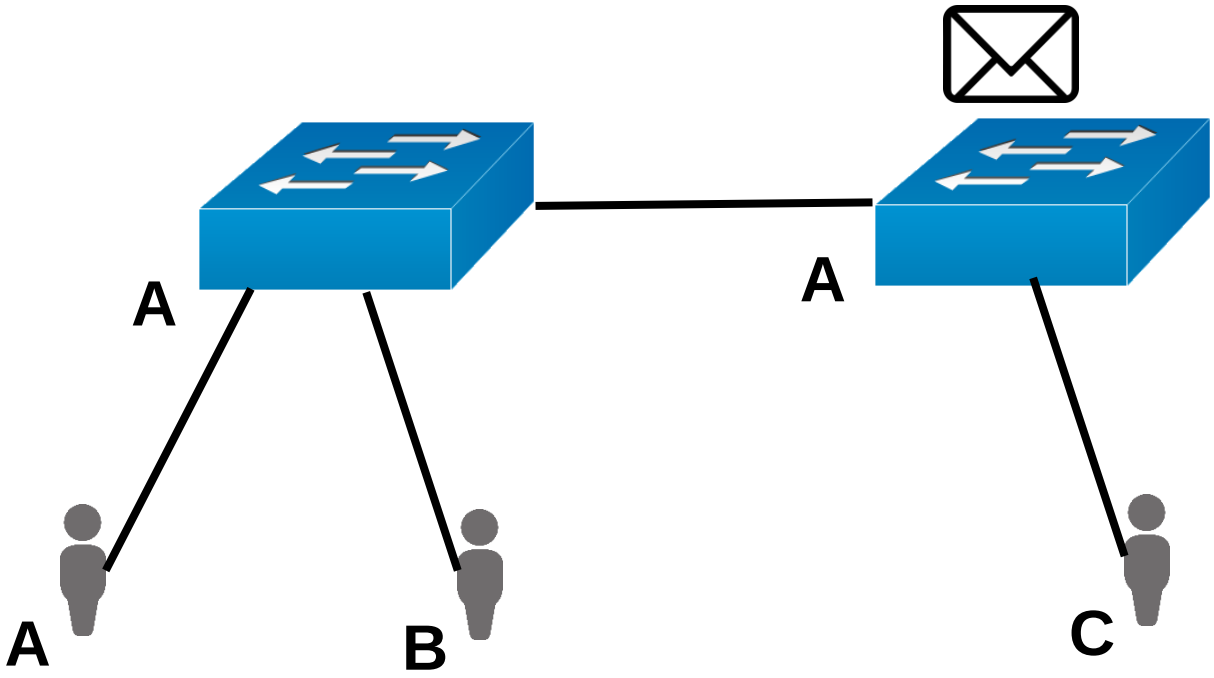

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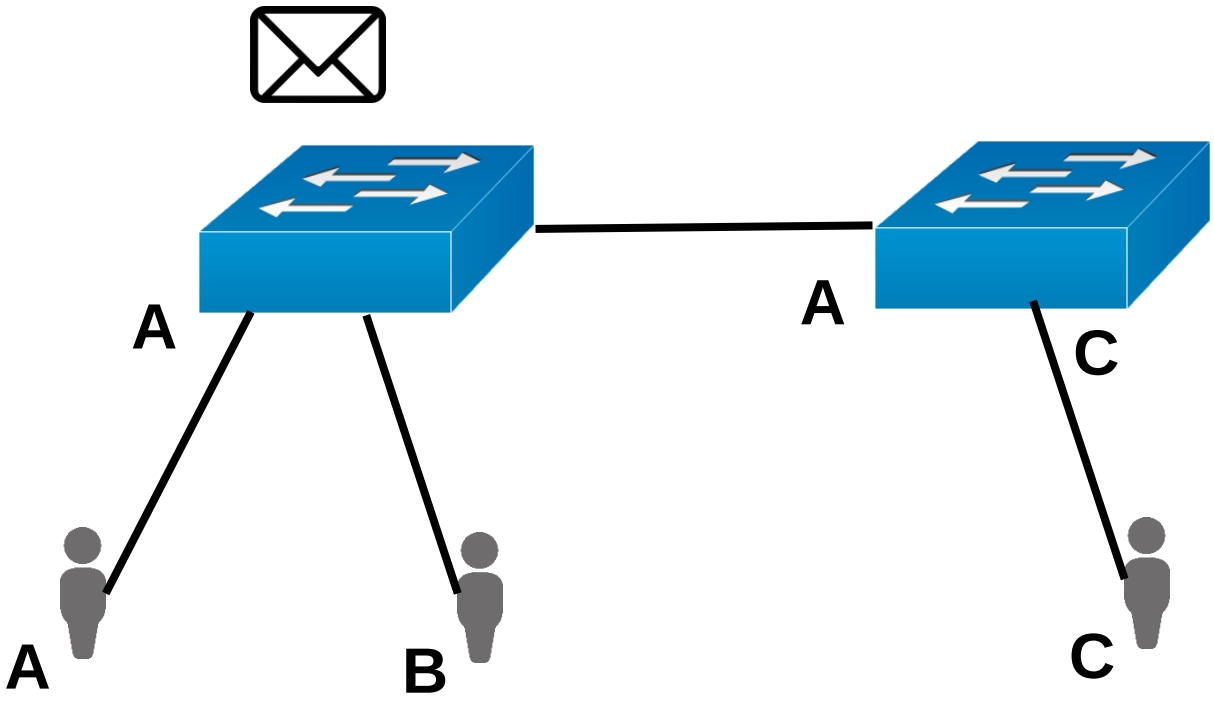
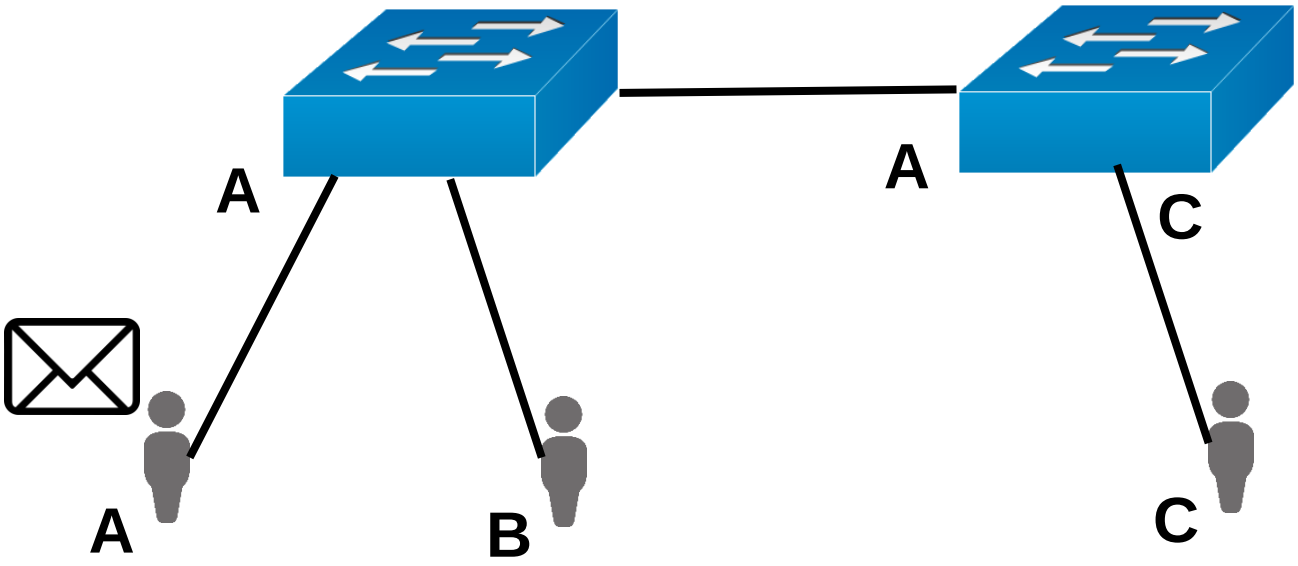
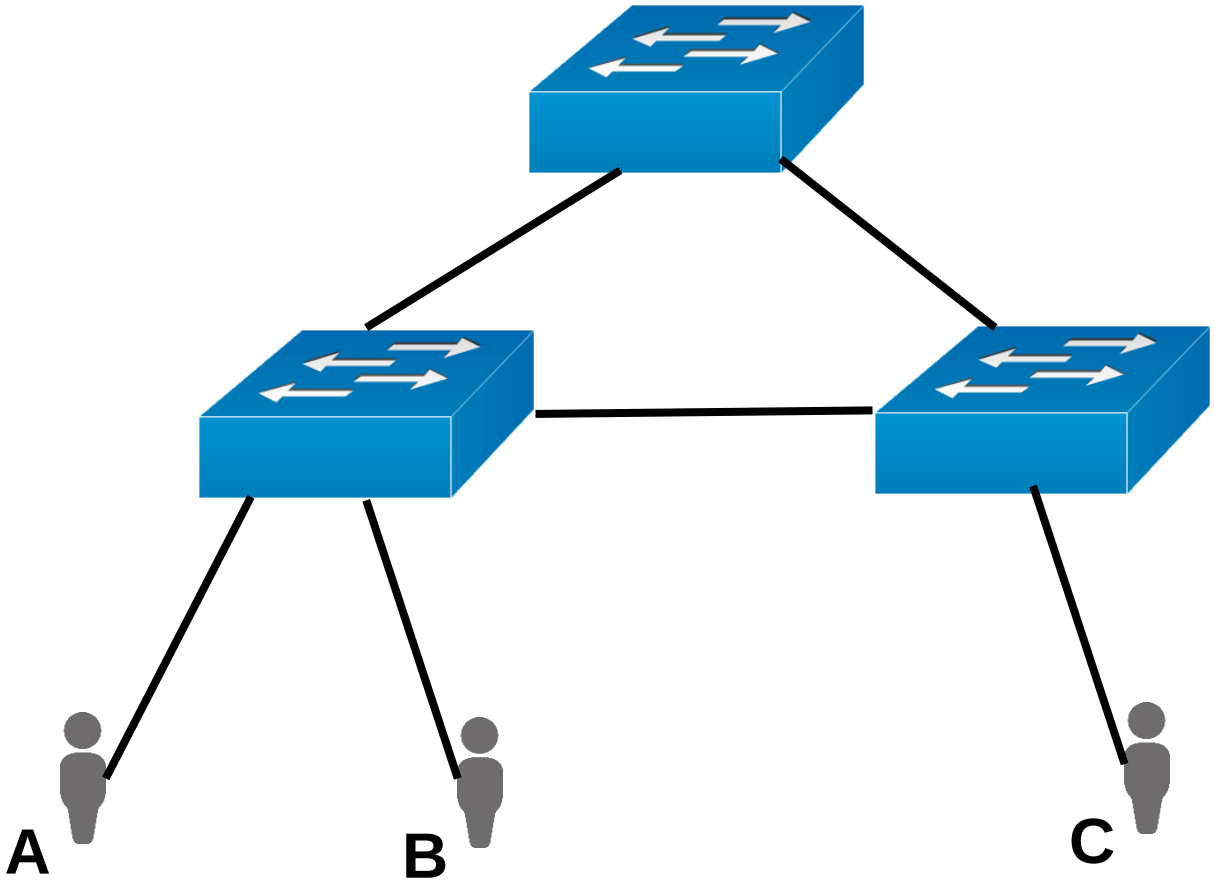


Ethernet – CAM table



Ethernet – CAM table – Probleme cu cicluri



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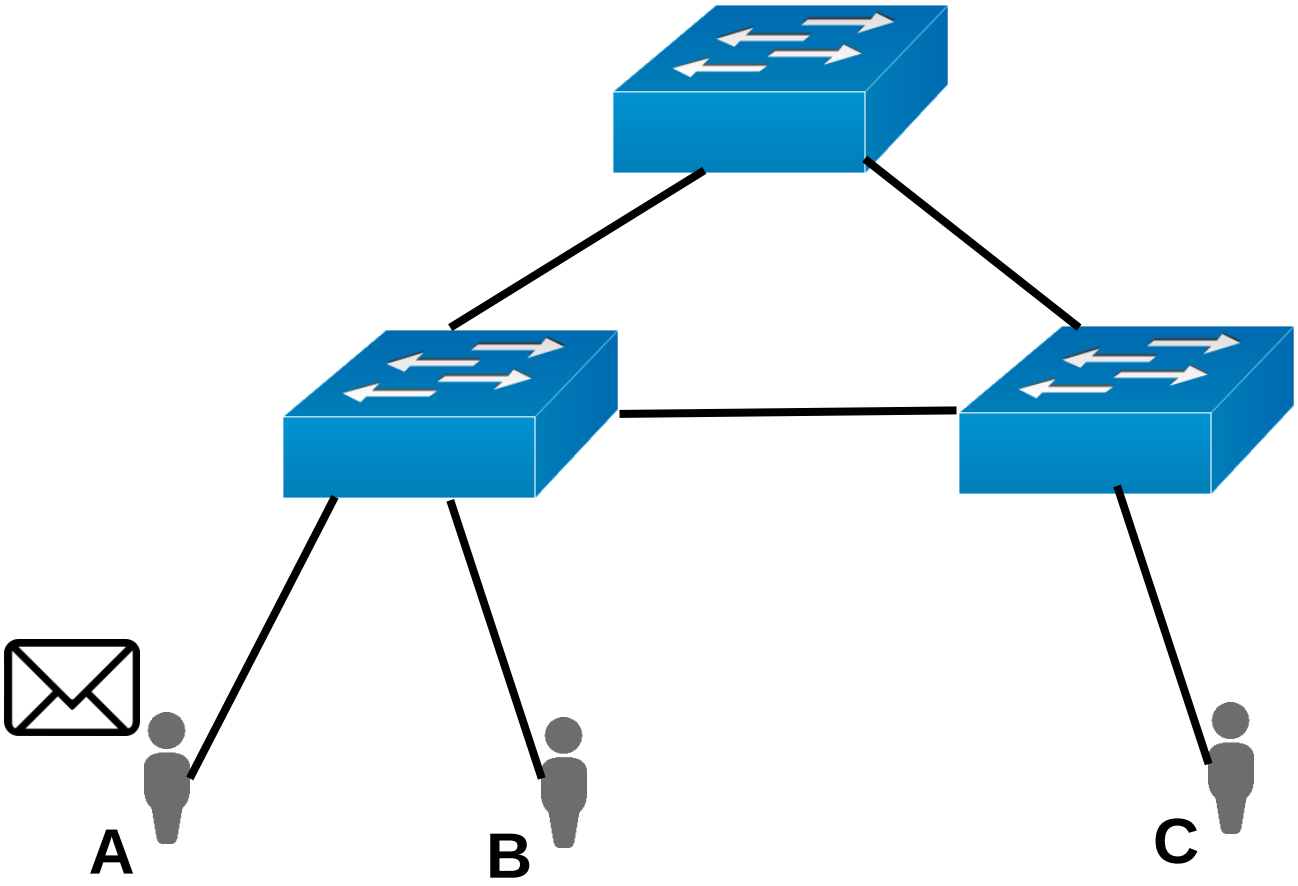

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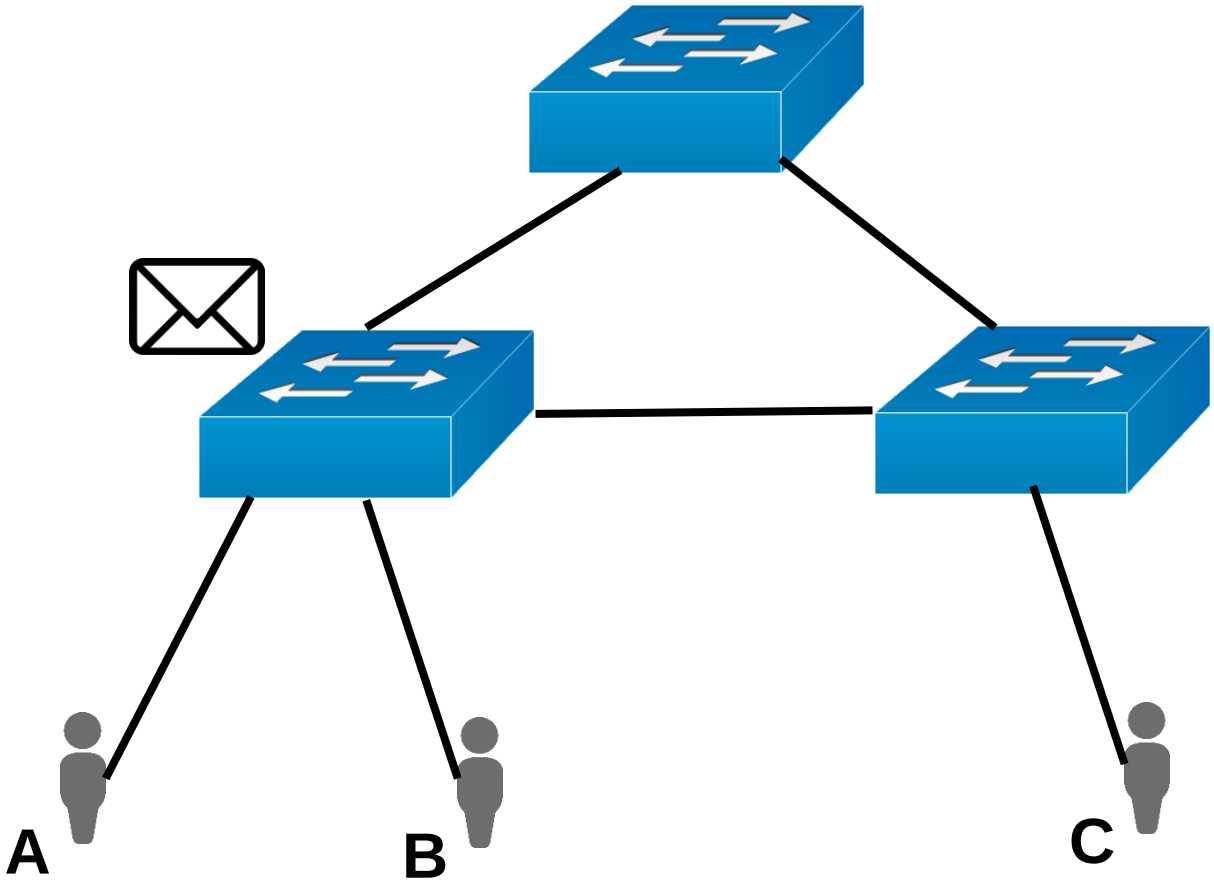

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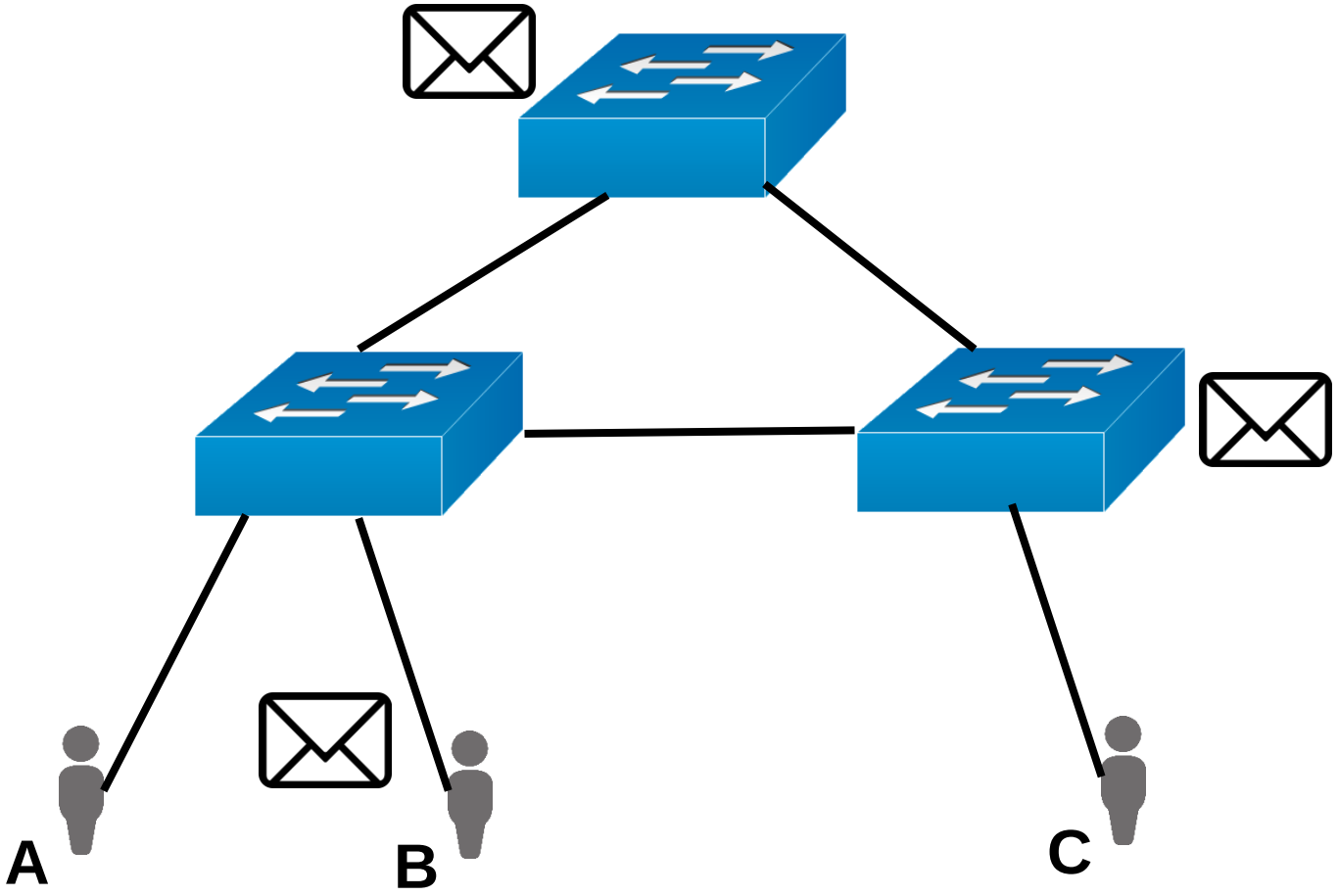

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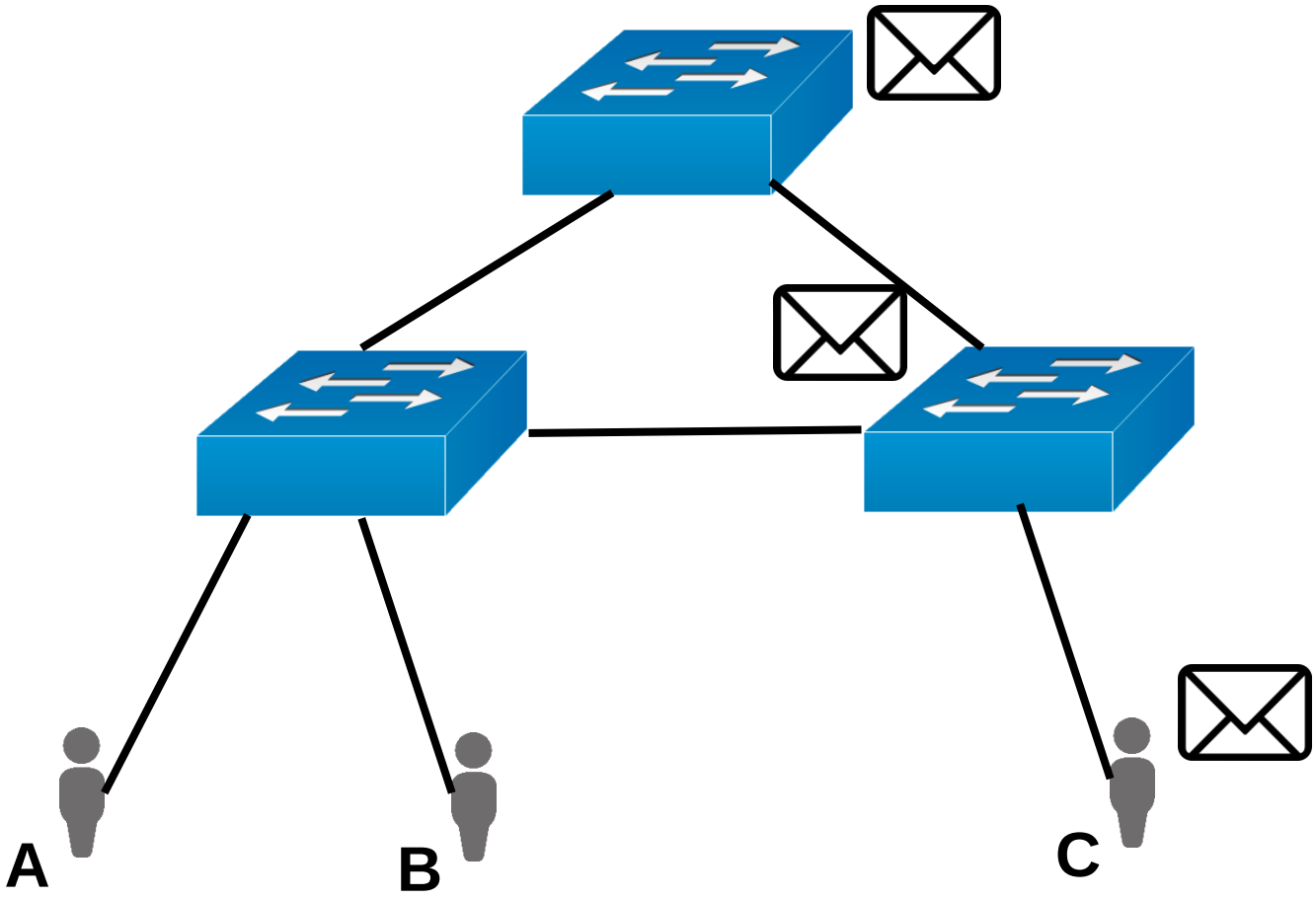

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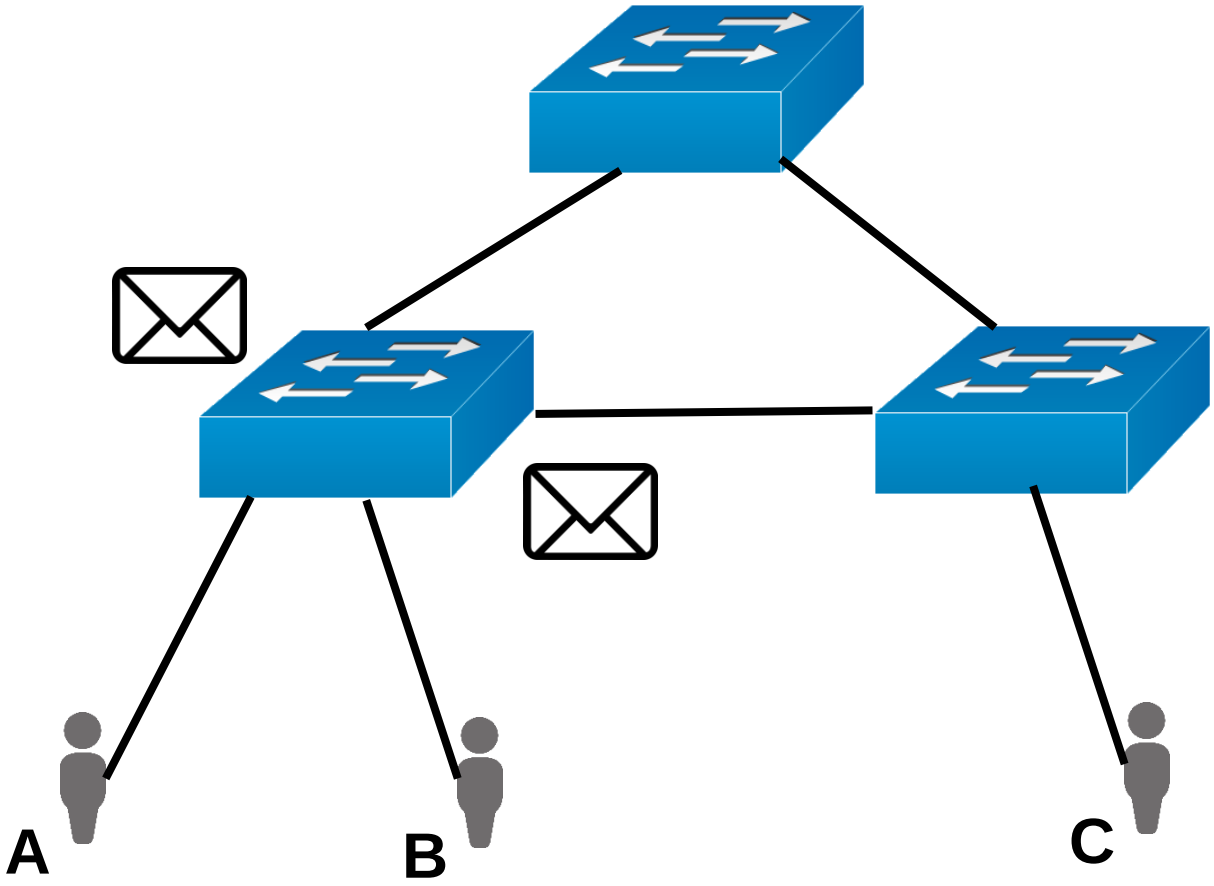

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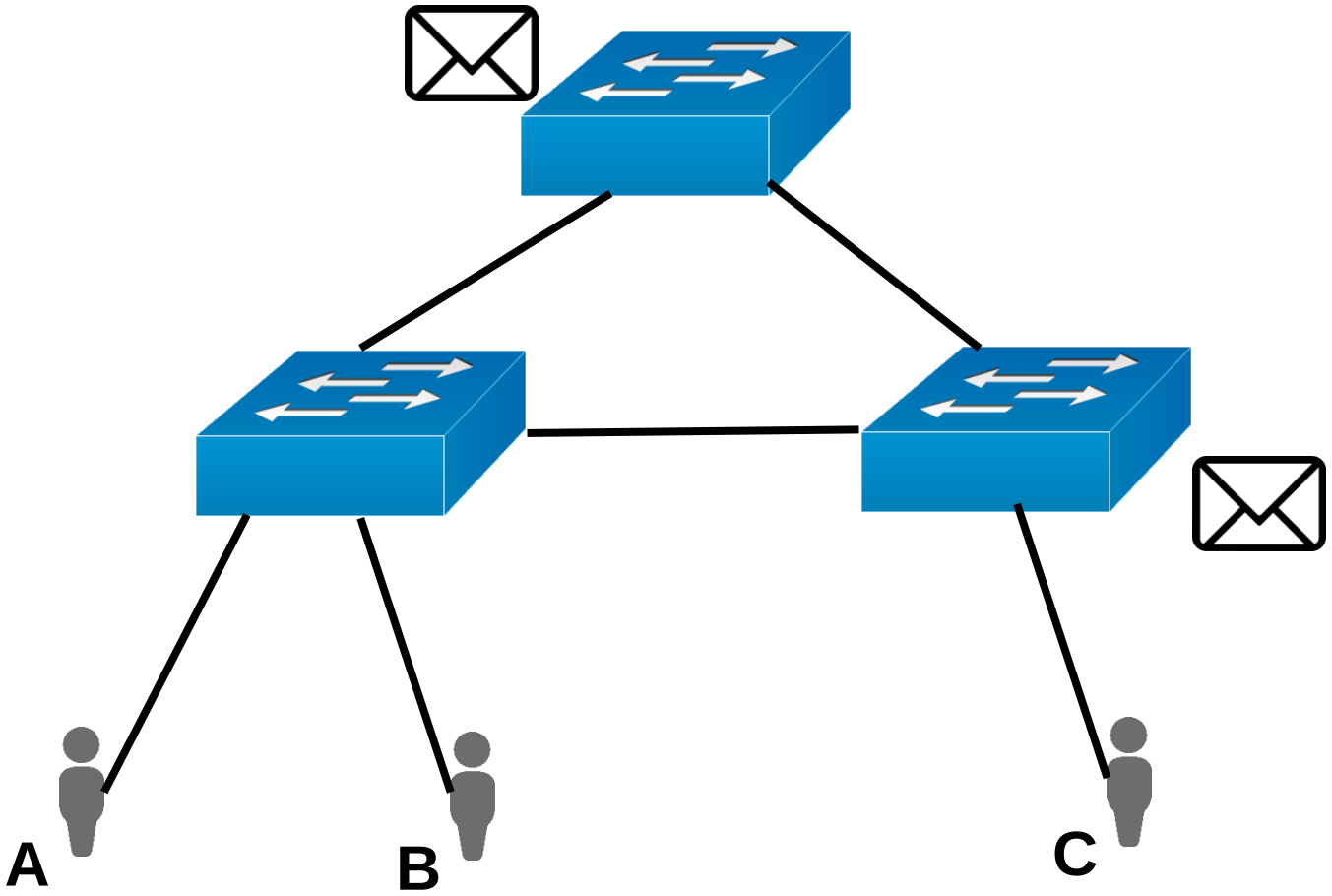

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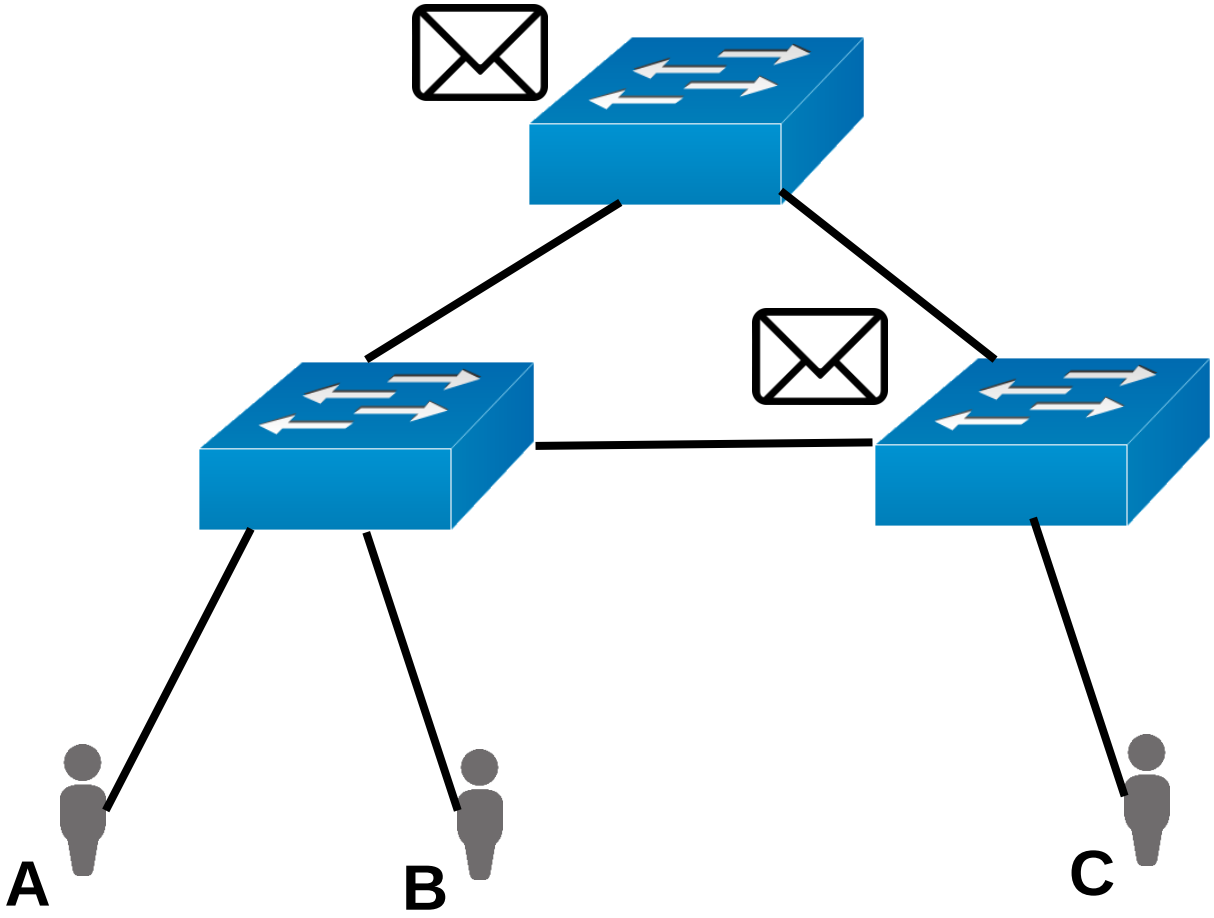

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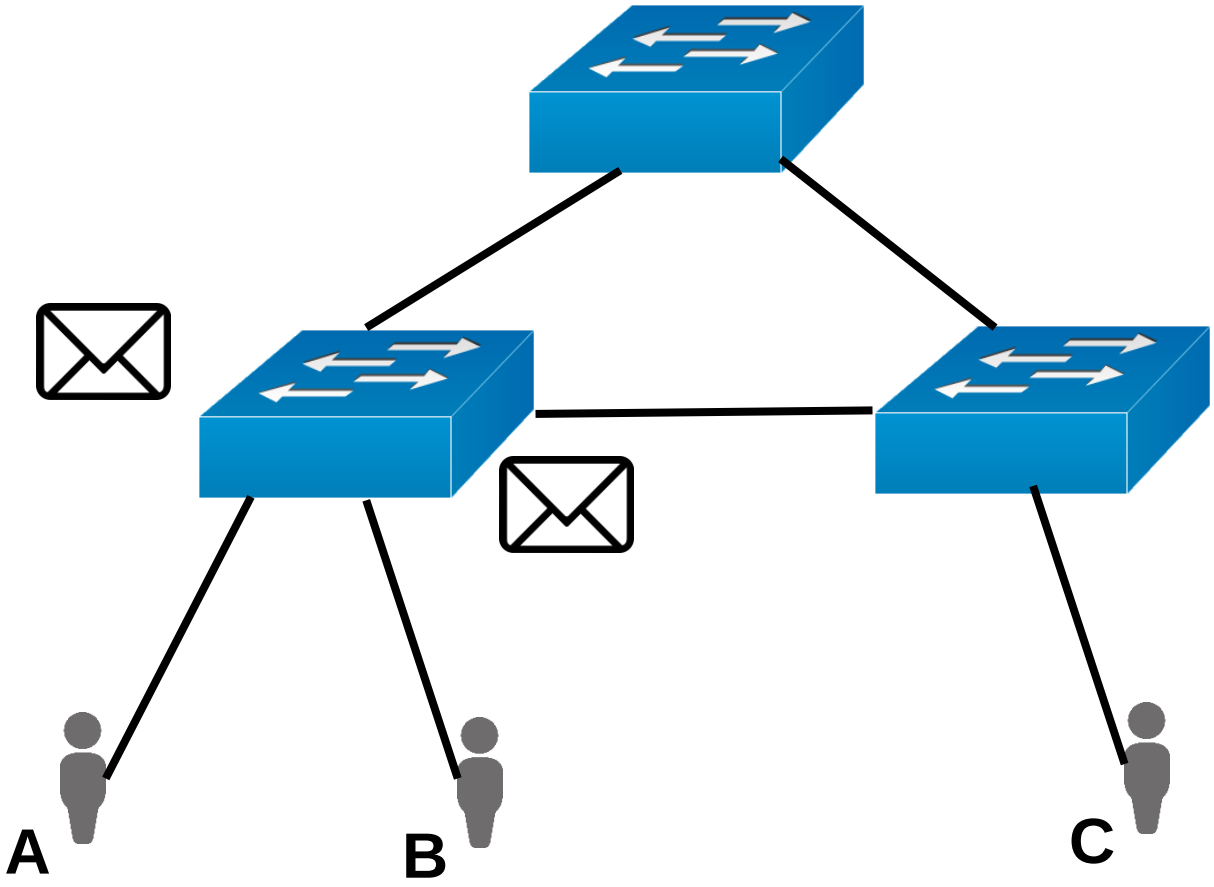
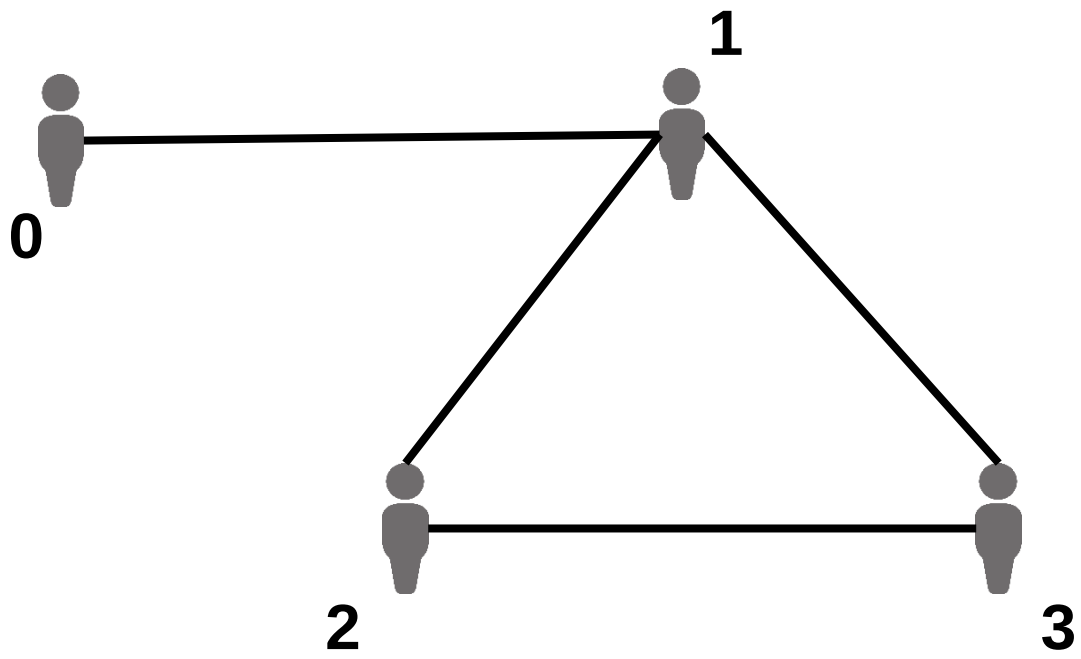


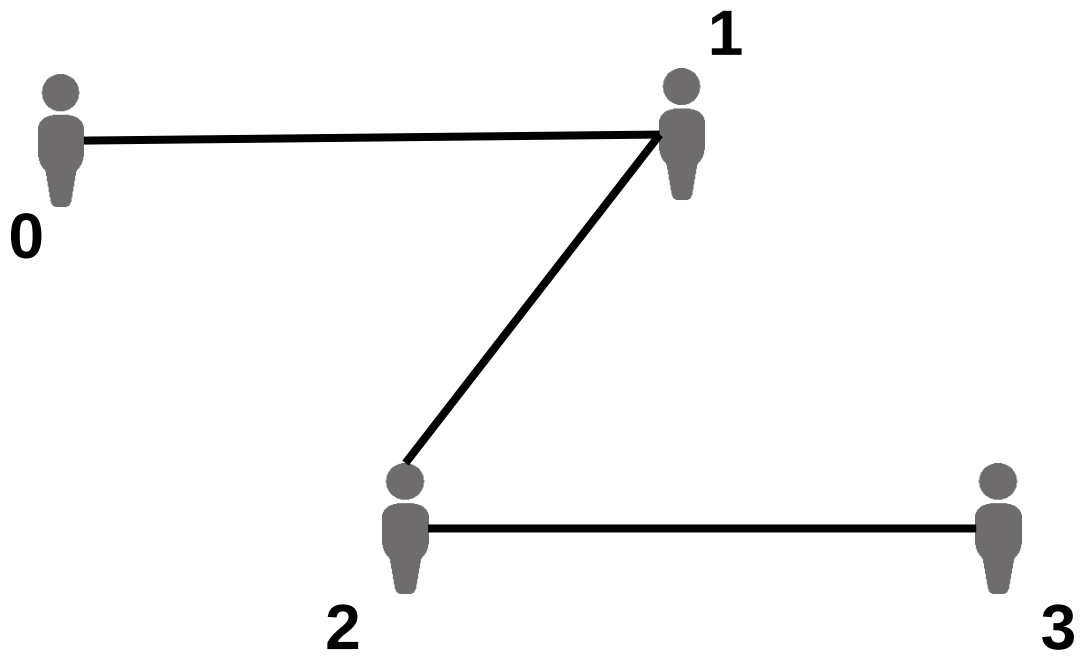
Cum eliminăm cicluri dintr-un graf?

Spanning Tree Protocol

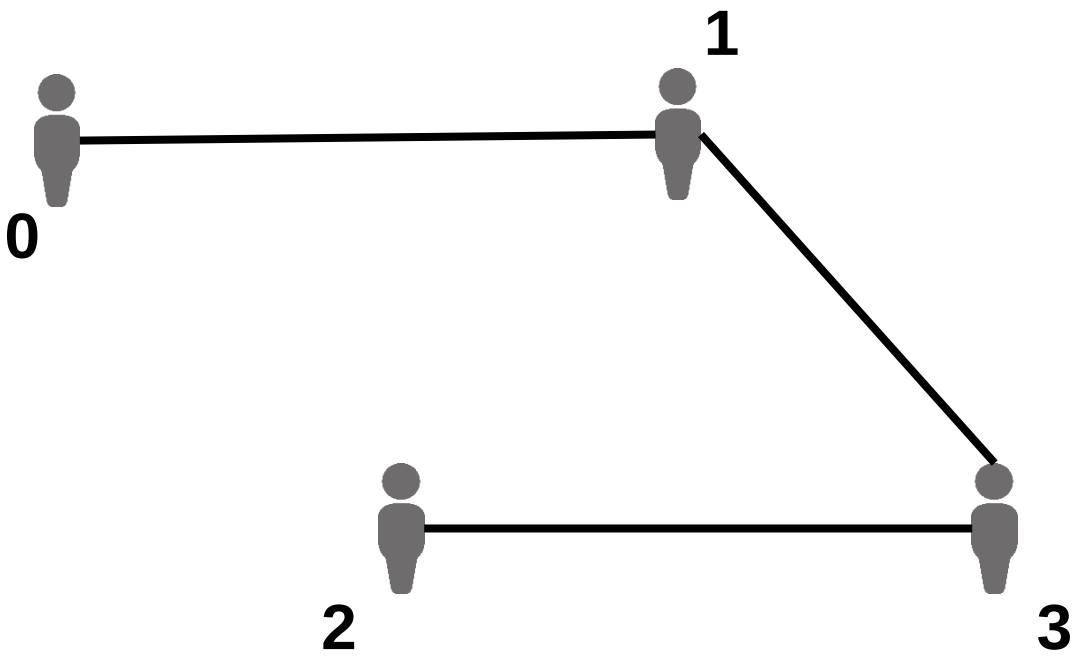
Distributed Spanning Tree



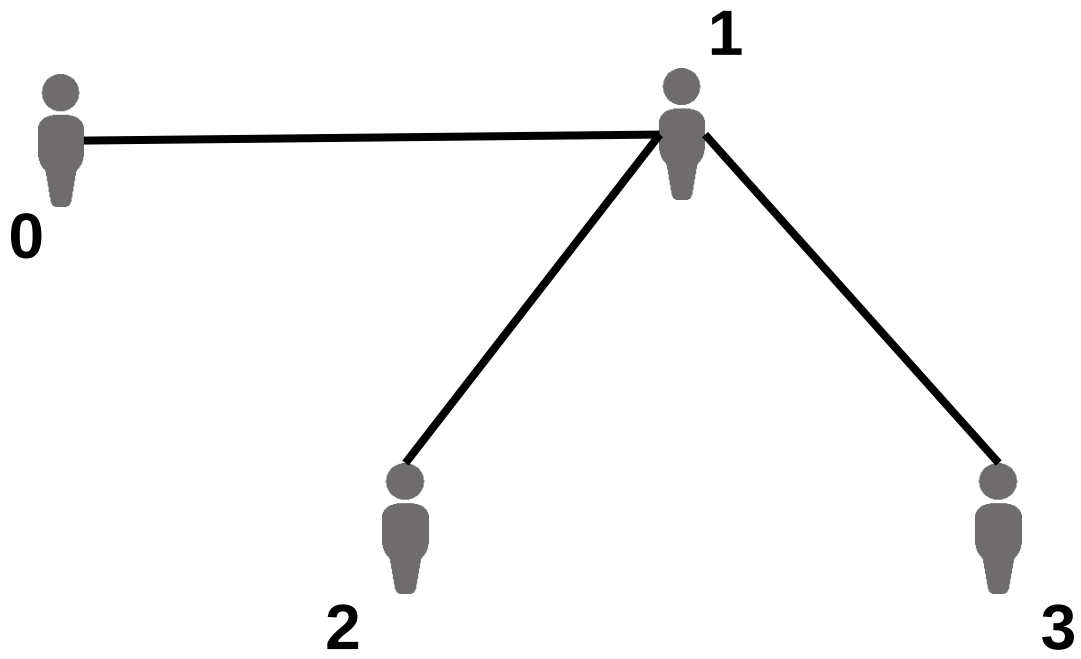
Distributed Spanning Tree - solution



Distributed Spanning Tree - solution

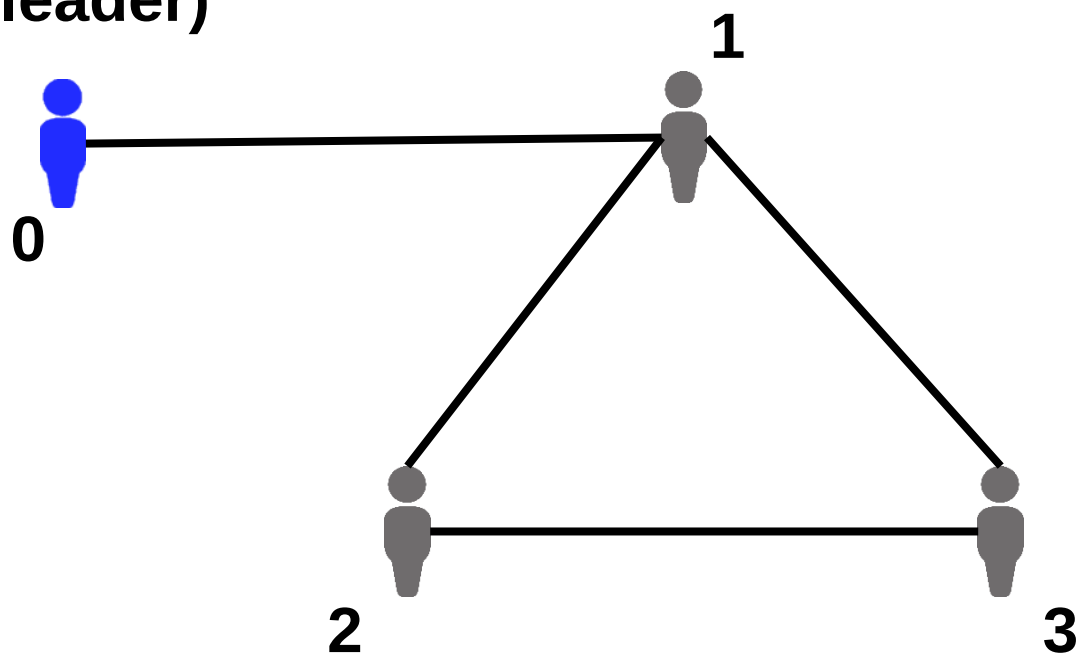


Distributed Spanning Tree - solution



Distributed Spanning Tree – Initiator

Initiator (leader)



Distributed Spanning Tree

Initiator (leader)

- Send Probe to all neighbors
- Receive response from all neighbors
- Compute the entire graph

- Send graph to everyone

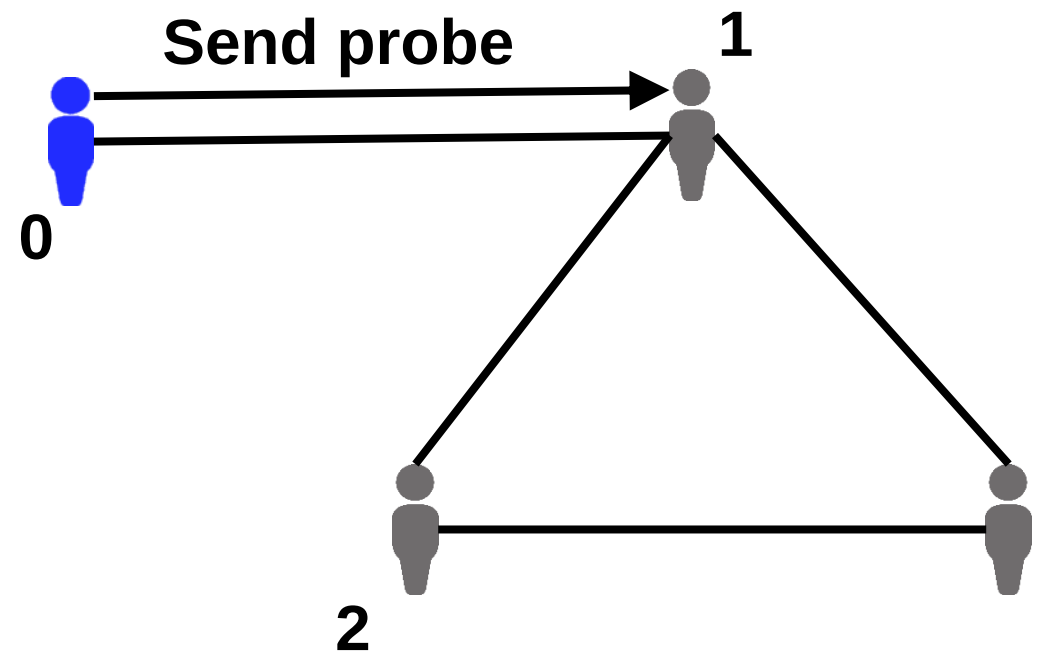
Distributed Spanning Tree

Everyone else

- Receive probe from someone
- That someone is marked as parent
- Forward probe to all neighbors except parent
- Receive response from all neighbors
- Merge responses
- Send response to parent

Distributed Spanning Tree

Node	Parent
0	-
1	
2	
3	

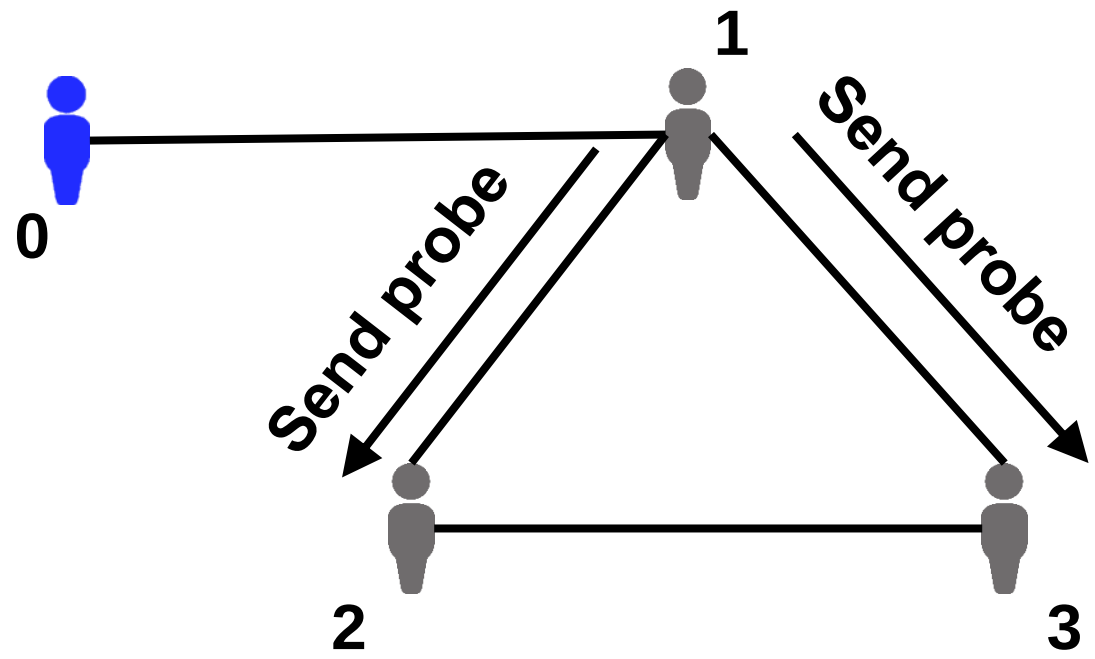


Node 2
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Node 3
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Distributed Spanning Tree

Node	Parent
0	-
1	0
2	
3	

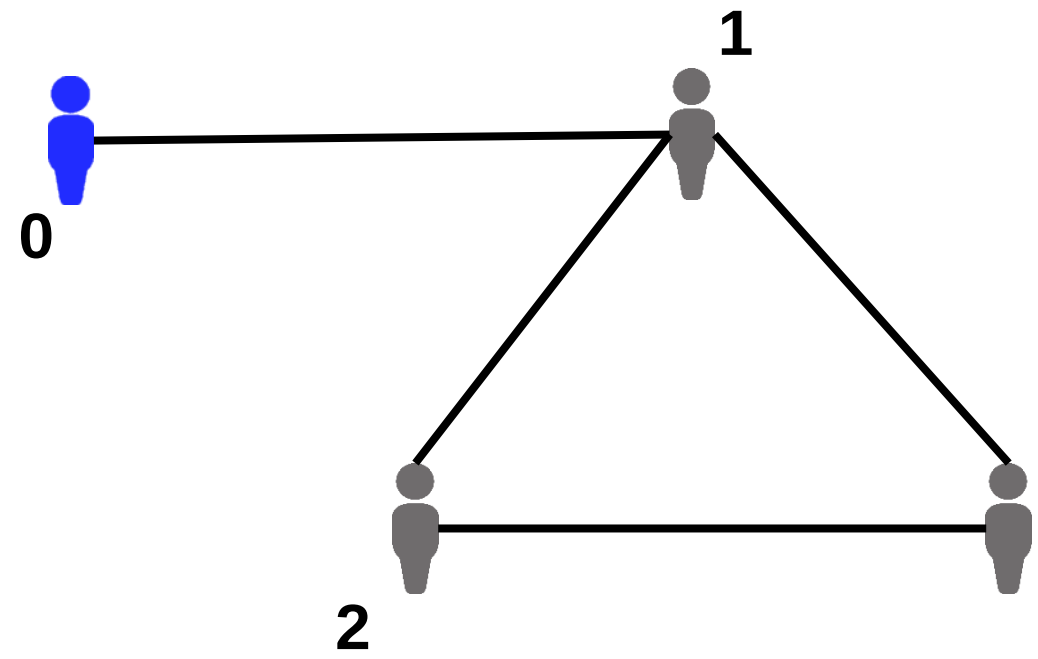


Node 2
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Node 3
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Distributed Spanning Tree

Node	Parent
0	-
1	0
2	1
3	1



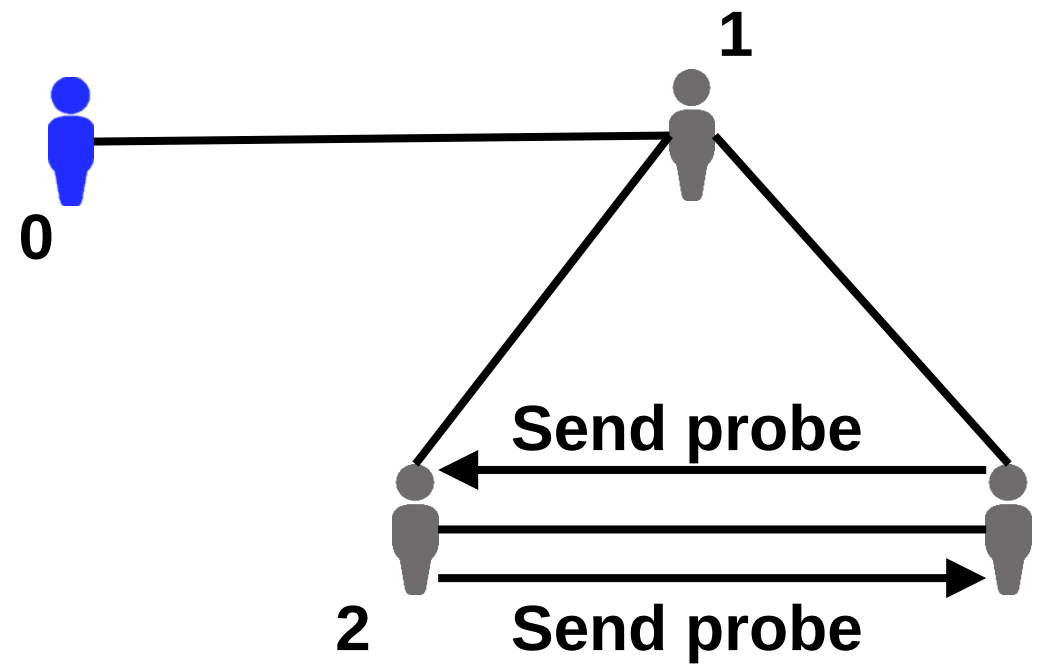
Node 2
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Node 3
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Distributed Spanning Tree – Initiator

2 and 3 treat each others probes as responses

Node	Parent
0	-
1	0
2	1
3	1



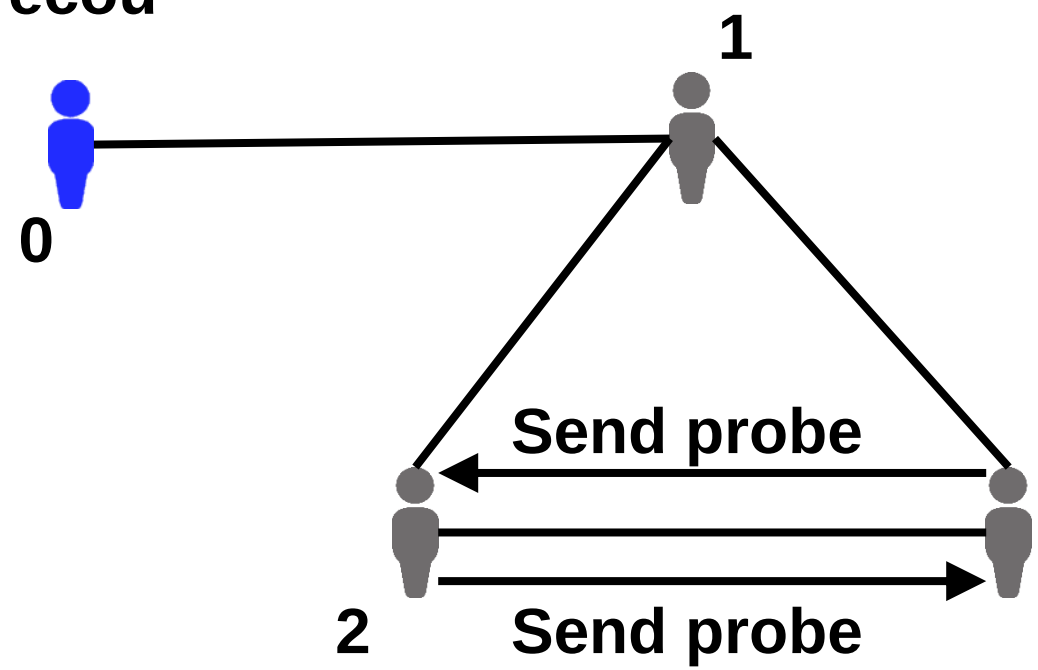
Node 2
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Node 3
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Distributed Spanning Tree – Initiator

Funcționează doar dacă proba are același format ca ecou

Node	Parent
0	-
1	0
2	1
3	1

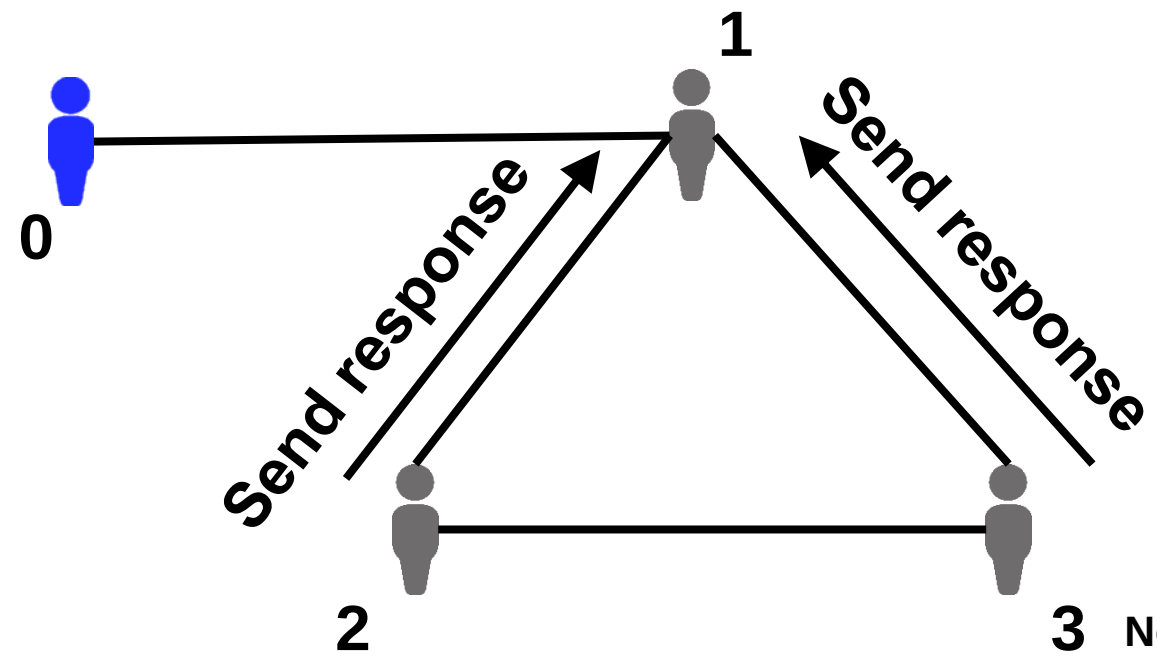


Node 2
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Node 3
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Distributed Spanning Tree

Node	Parent
0	-
1	0
2	1
3	1



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Merge responses
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Node 3
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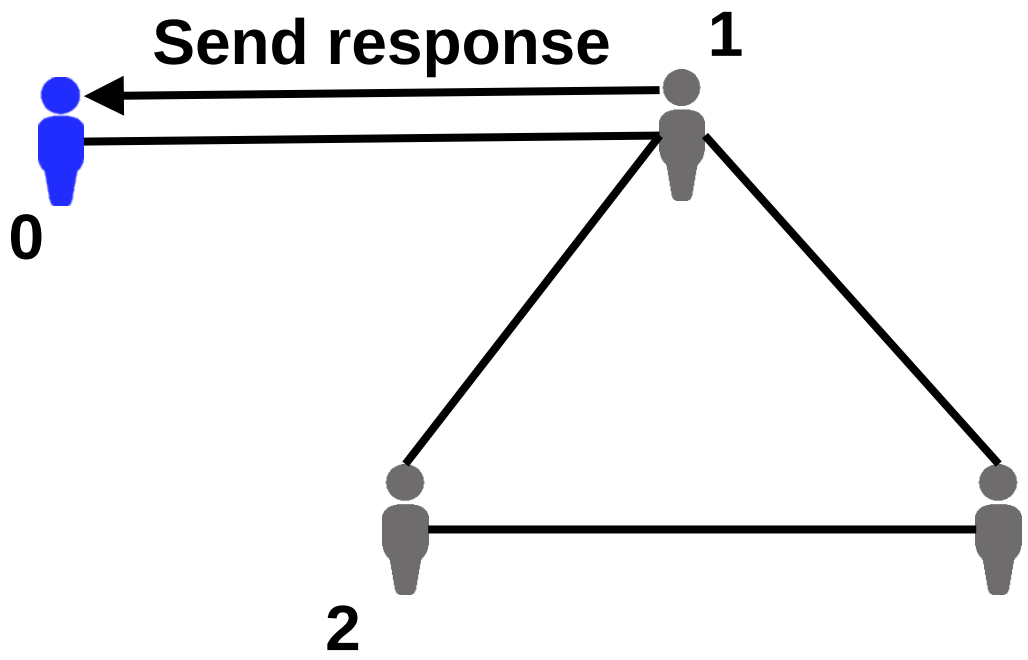
Send probe children
Recv response children
Merge responses
Send response parent

Distributed Spanning Tree

Node	Parent
0	-
1	0
2	1
3	1



Node 2
Recv probe
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Send probe children
Recv response children
Merge responses
Send response parent

Node 3
Recv probe
Mark parent
Send probe children
Recv response children
Merge responses
Send response parent

Distributed Spanning Tree

Cum alegem inițiatorul?

Distributed Spanning Tree

Cum alegem inițiatorul?

0 Cursurile viitoare –

Algoritm Alegerea liderului

Distributed Spanning Tree

Avantajul acestui algoritm?
Comunicație full sincronă


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Stabilirea Topologiei IP

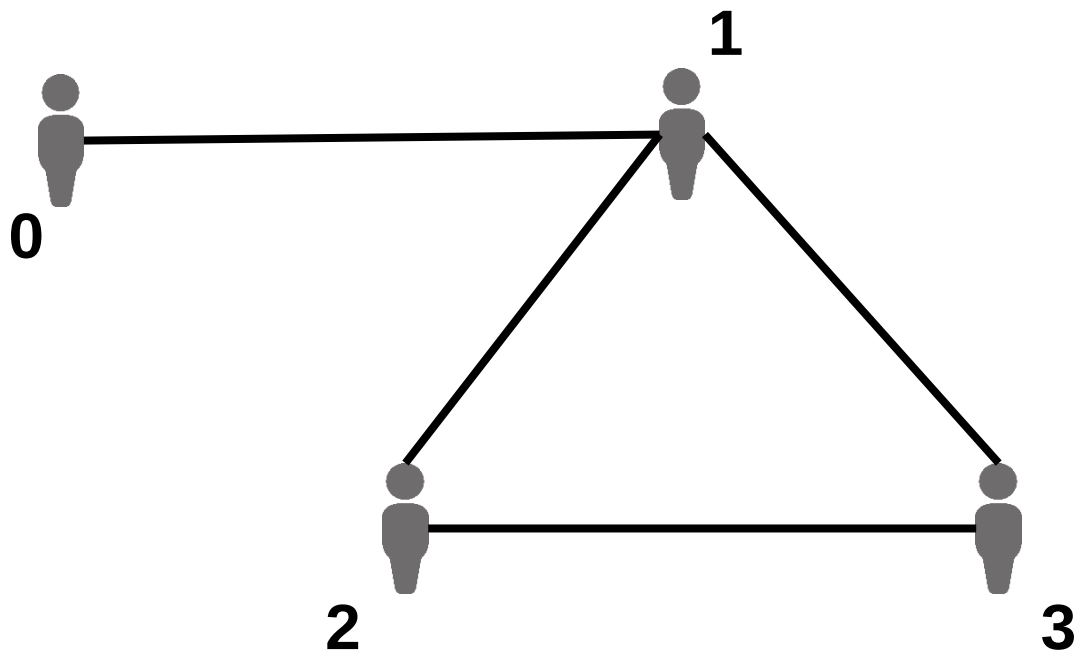
- În alte cuvinte: stabilirea rutelor și tabelelor de rutare.

Algoritmi de stabilire rute în IP?

Algoritmi de stabilire rute în IP?

- BGP
- RIP
- IGRP
- EIGRP
- OSPF
- …

Algoritm stabilire topologie



Algoritm stabilire topologie

Trimite topologie cunoscută tuturor vecinilor
Primește de la toți vecinii topologiile cunoscute de ei
Adaugă informații la topologia cunoscută.

Repetă la infinit!!

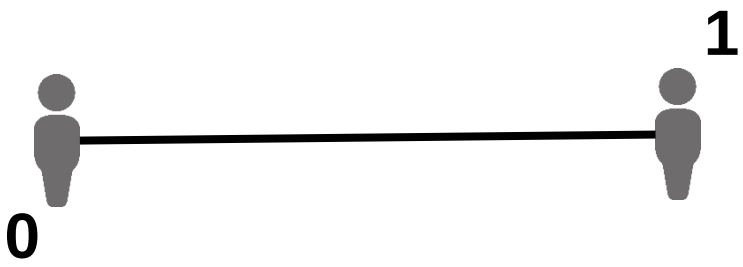
Algoritm stabilire topologie

Trimite topologie cunoscută tuturor vecinilor
Primește de la toți vecinii topologiile cunoscute de ei
Adaugă informații la topologia cunoscută.

Repetă la infinit!!

Atenție în forma actuală nu se pot șterge conexiuni.

Topologii inițiale - 0



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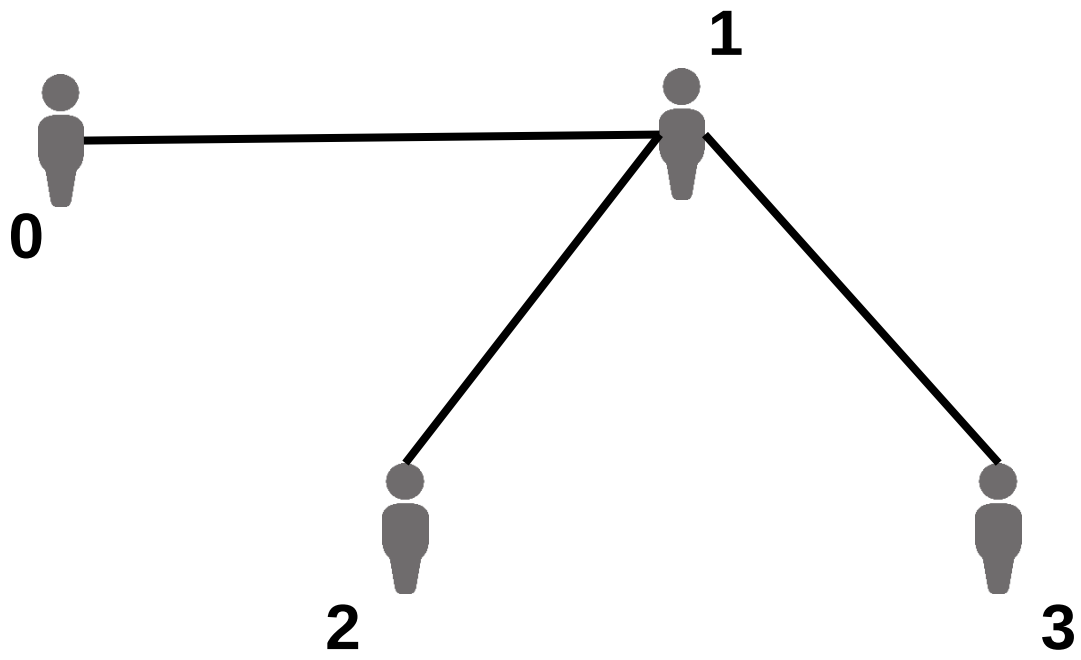

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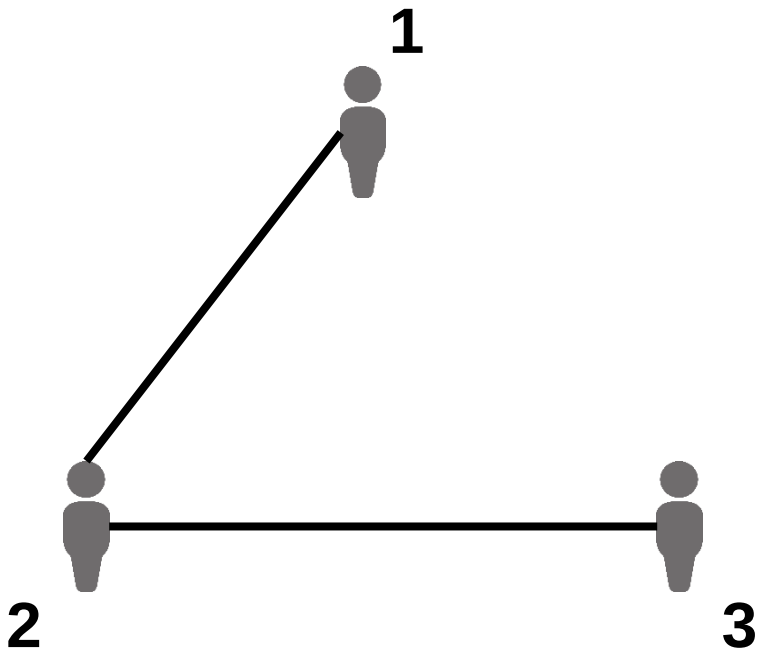

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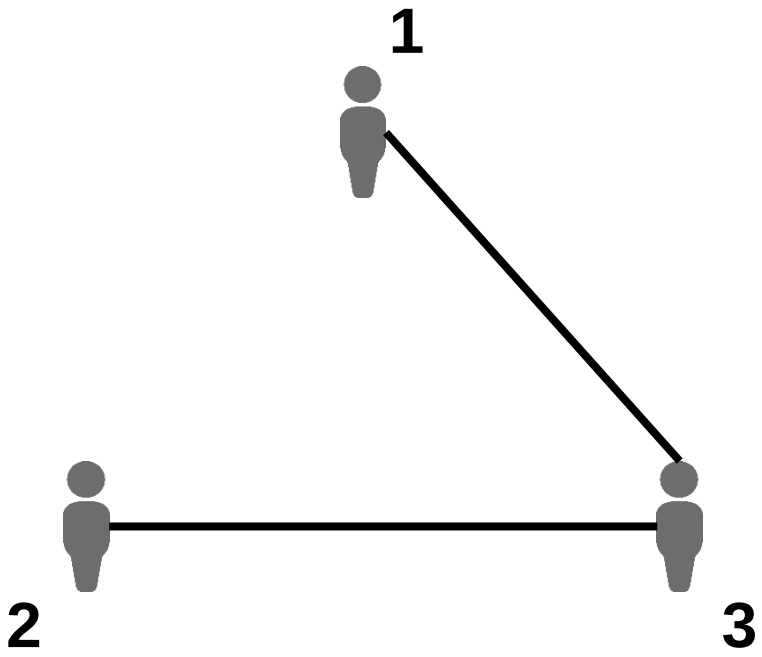
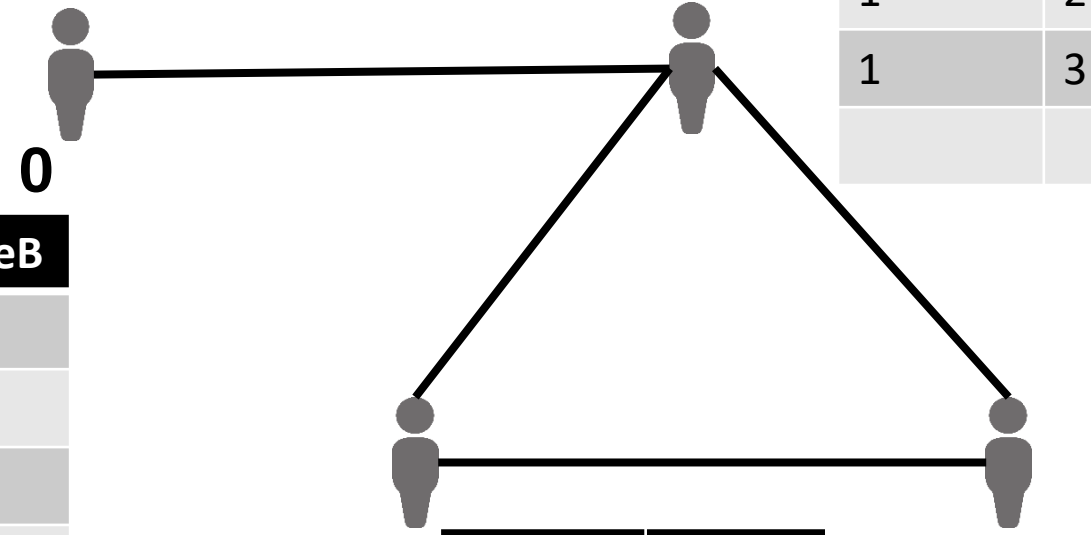


Algoritm stabilire topologie



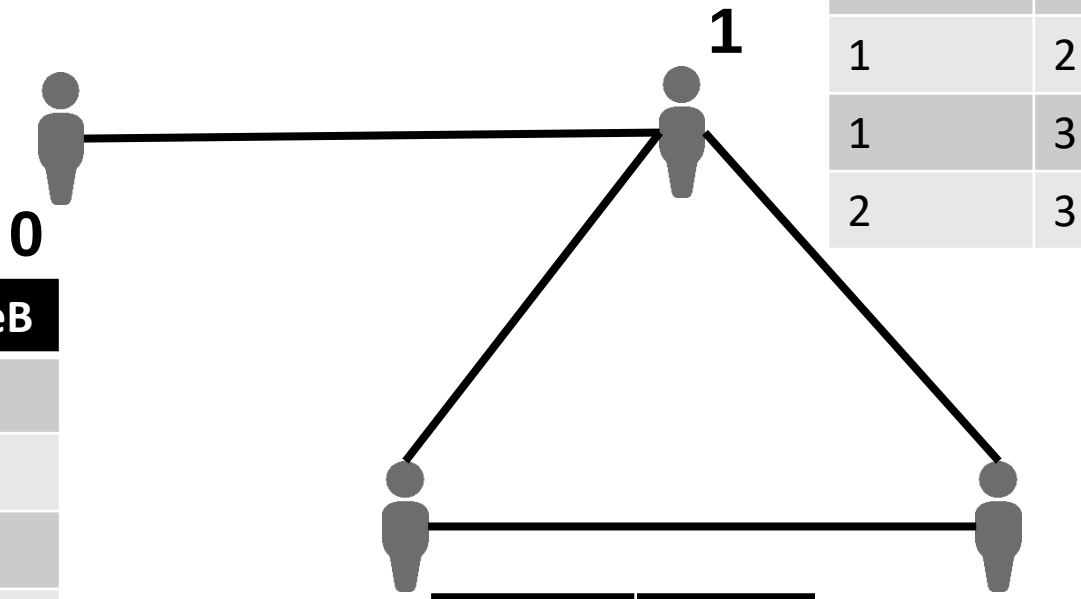
NodeA	NodeB
1	0
1	2
1	3

NodeA	NodeB
0	1

NodeA	NodeB
2	1
2	3

NodeA	NodeB
3	1
3	2

Algoritm stabilire topologie



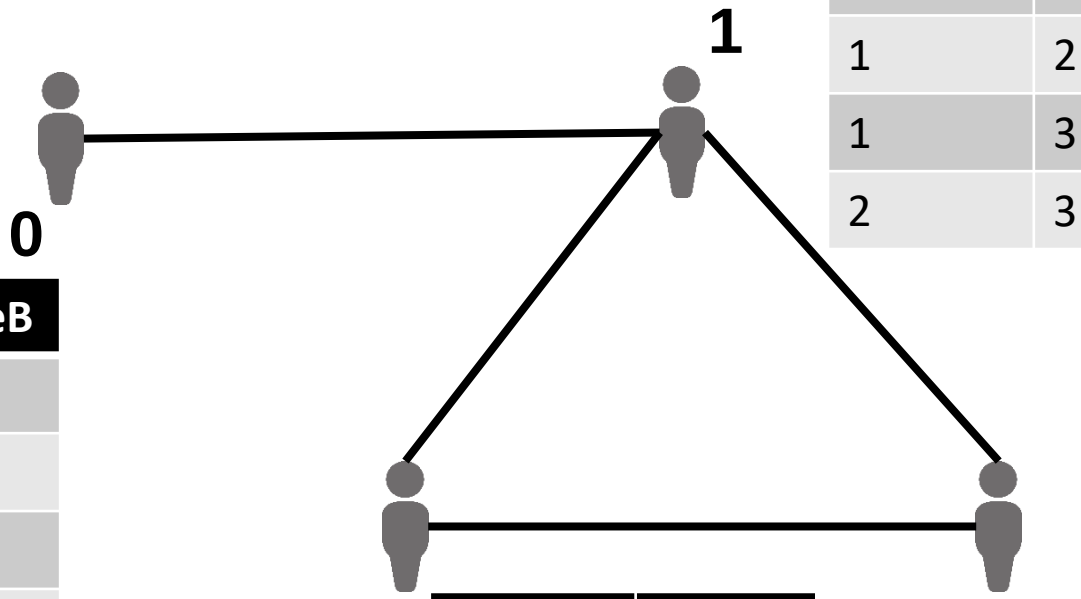
NodeA	NodeB
1	0
1	2
1	3
2	3

NodeA	NodeB
0	1
1	2
1	3

NodeA	NodeB
2	1
2	3
1	0
1	3

NodeA	NodeB
3	1
3	2
1	0
1	2

Algoritm stabilire topologie



NodeA	NodeB
1	0
1	2
1	3
2	3

NodeA	NodeB
0	1
1	2
1	3
2	3

NodeA	NodeB
2	1
2	3
1	0
1	3

NodeA	NodeB
3	1
3	2
1	0
1	2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Who made The World-Wide Web?

Who made the World-Wide Web? - Tim Berners-Lee

Network Working Group
Request for Comments: 2068
Category: Standards Track

R. Fielding
UC Irvine
J. Gettys
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DEC
H. Frystyk
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MIT/LCS
January 1997

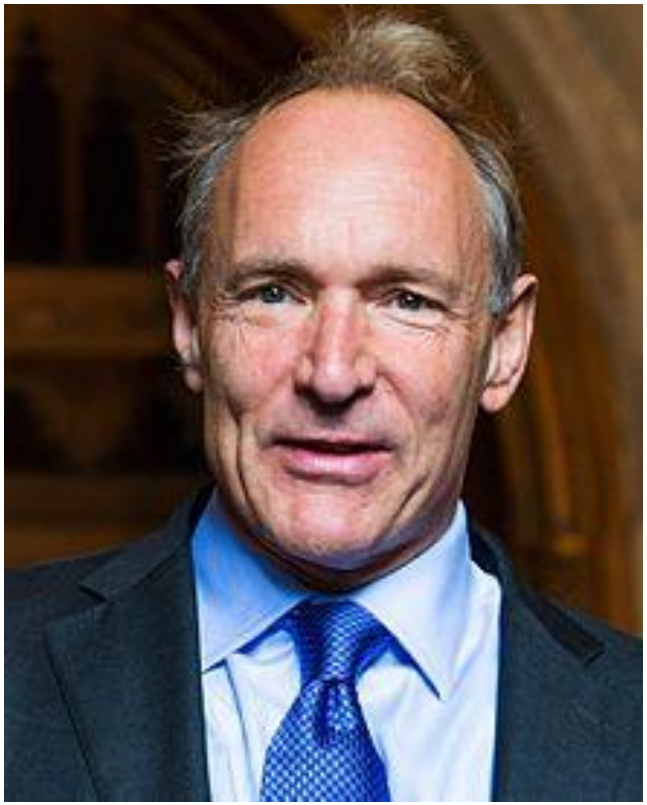
Hypertext Transfer Protocol -- HTTP/1.1

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Abstract

The Hypertext Transfer Protocol (HTTP) is an application-level protocol for distributed, collaborative, hypermedia information systems. It is a generic, stateless, object-oriented protocol which can be used for many tasks, such as name servers and distributed object management systems, through extension of its request methods. A feature of HTTP is the typing and negotiation of data representation, allowing systems to be built independently of the data being transferred.



Who made the World-Wide Web? - Tim Berners-Lee

Network Working Group
Request for Comments: 1738
Category: Standards Track

T. Berners-Lee
CERN
L. Masinter
Xerox Corporation
M. McCahill
University of Minnesota
Editors
December 1994

Uniform Resource Locators (URL)

Status of this Memo

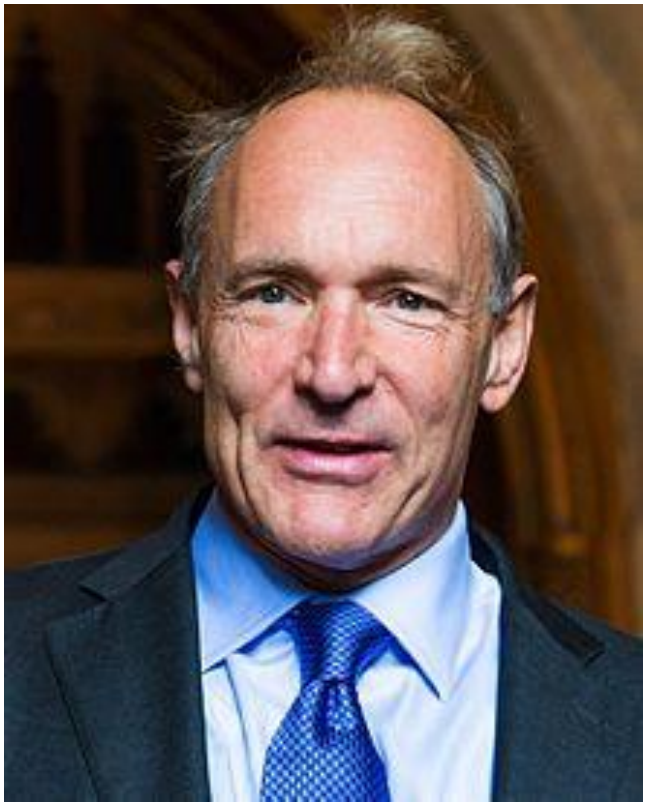
This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Abstract

This document specifies a Uniform Resource Locator (URL), the syntax and semantics of formalized information for location and access of resources via the Internet.

1. Introduction

This document describes the syntax and semantics for a compact string representation for a resource available via the Internet. These



URL