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CSCI 101
Connecting with Computer Science
Lecture 2: Introduction to WWW III

Jetic Gū

2020 Fall Semester (S3)

Overview

- Focus: Internet
- Architecture: von Neumann
- Readings: 1
- Core Ideas:
    1. Basic Communications in the Internet
    2. Things to Think about, Cont.

Basic Communications in the Internet

Summary

P1
Communications

Review

- Computers are accessed by IP addresses
  - Domain/URL resolution through DNS -> DNS servers provide IP addresses like a yellow phone book
- Data are transmitted as packets
  - Webpages: HTML (hypertext markup language)
  - Protocols (ways of transmitting): e.g. HTTP, HTTPS (encrypted secure-HTTP)

Review

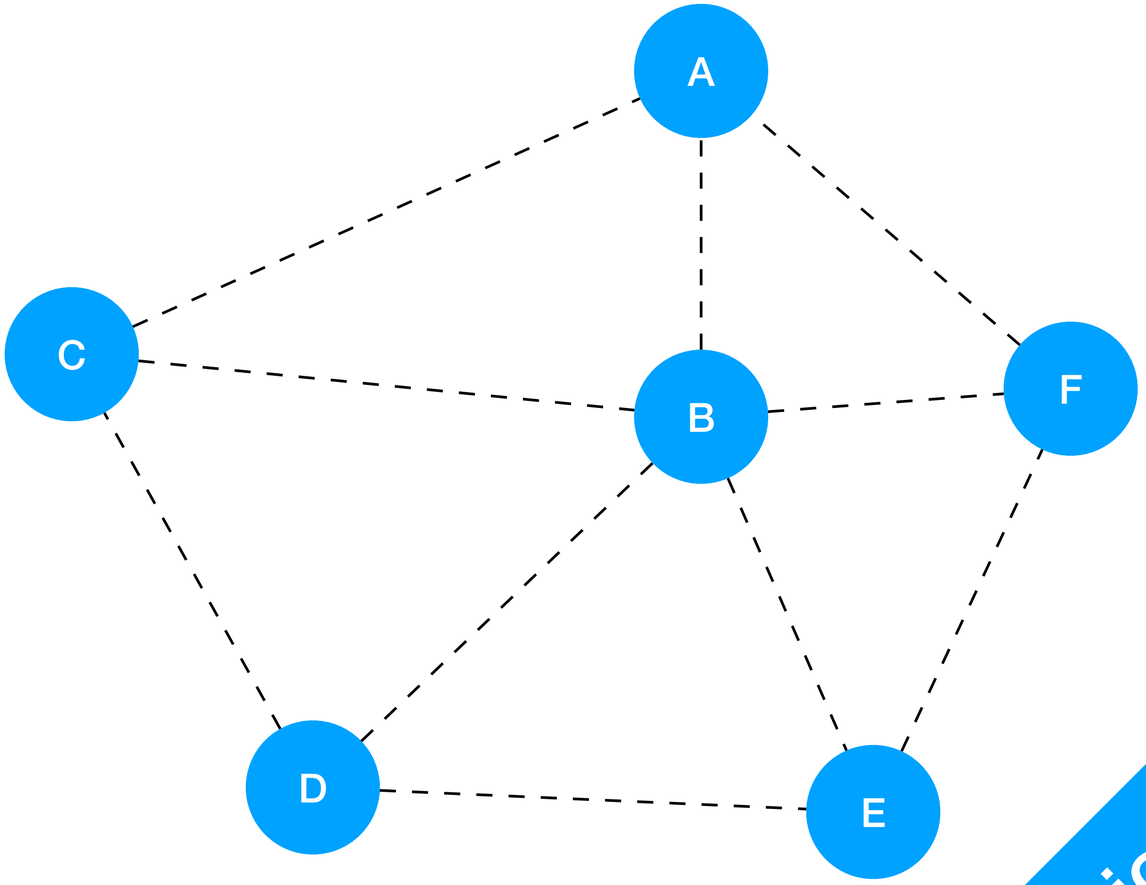
But wait, there are more problems!

- Q: How do computers find a remote server using its IP address?
  - A: Through **internet routing** (routing problem )
- Q: Are IP addresses unique?
  - A: for any network, the IP addresses for directly connected devices **are unique**
- Q: How do packets reach my computer in a local area network, which doesn't have a public IP address?
  - A: Through Gateways. e.g., your router will help sorting out packets to your phone, your tablet, your TV, and your laptops

Concept

Routing Problem

- How to send a packet from C to F?
  - C **knows** which nodes it is connected to (**neighbours**)
  - using A, B, or D and E as **hops**
- Multiple algorithms and protocols exist for different types of networks
  - Static
  - Routing Information Protocol (RIP)
  - Open Shortest Path First (OSPF); etc.



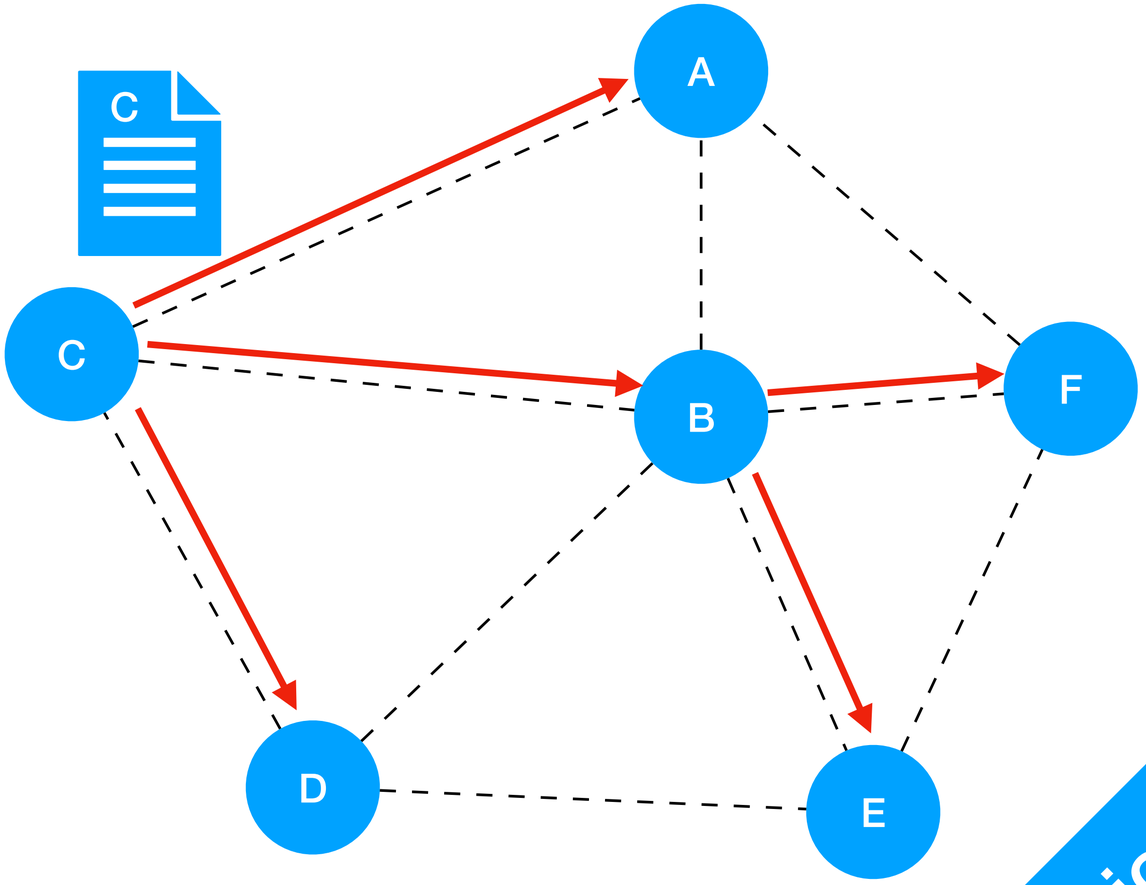
Routing Problem

- Uses **routing table**

- This is a **possible** routing table for **C**
  Dest A: -> A
  Dest B: -> B
  Dest D: -> D
  Dest F: -> B -> F
  Dest E: -> B -> E

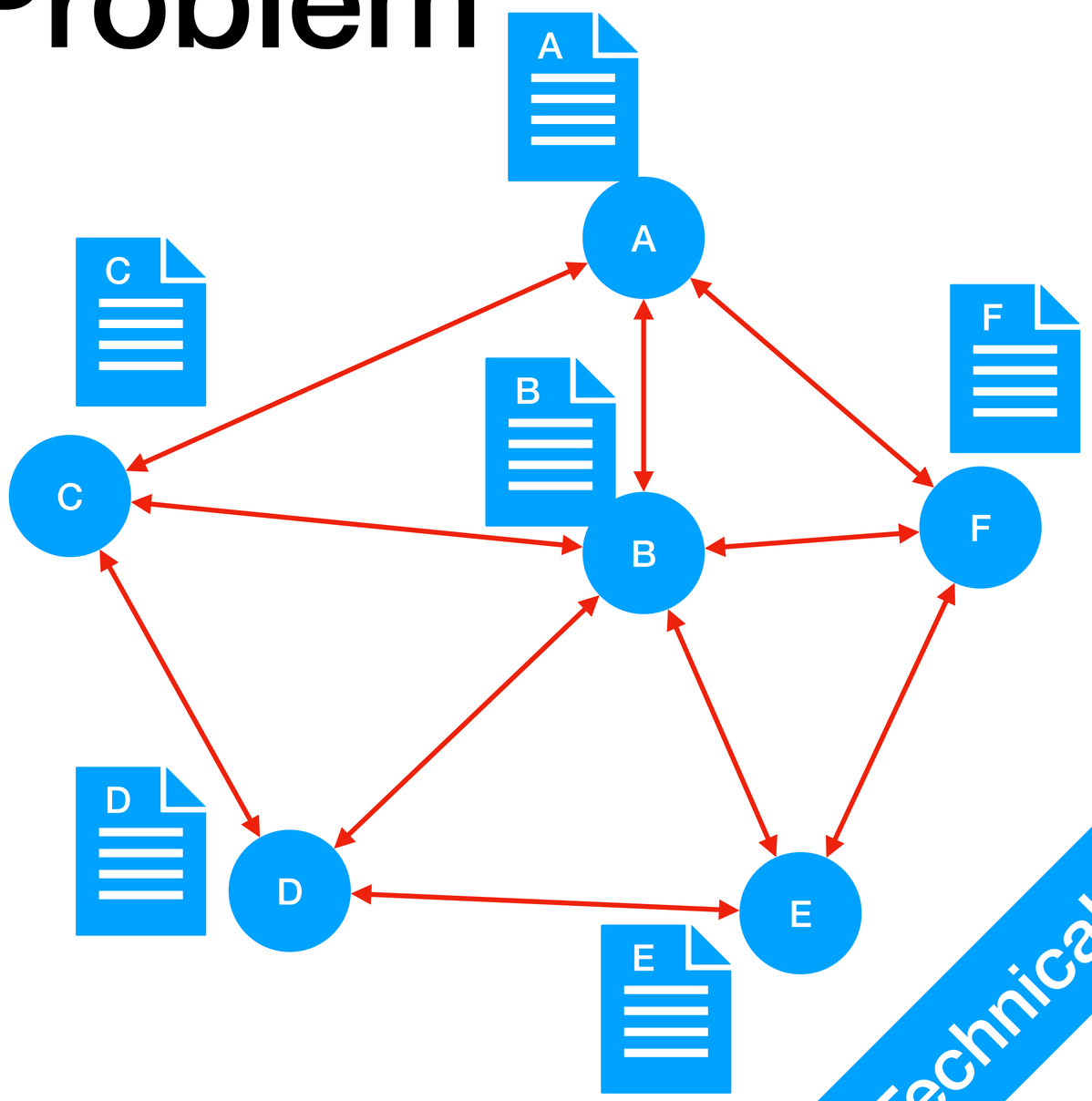
- Static
  Routing table is static (not updated)

  - Secure, but not flexible



Routing Problem

- **Routing Information Protocol** (RIP)
  Entire routing tables are shared between all devices periodically
  - Slow, sometimes insecure
- **Open Shortest Path First** (OSPF)
  Most **efficient** route is calculated **every time** based on available routing tables. Routing tables exchanged on request.
  - Large overhead



IP addresses

- Internet Protocol (IP) address
  - numerical label assigned to each device connected to a network that uses the TCP/IP protocol for communication
  - versions
    - IPv4 (most common), 32 bits long,
      e.g. `192.168.0.1`
    - IPv6 (gradually expanding), 128 **bits** long,
      e.g. `FE80:CD00:0000:0CDE:1257:0000:211E:729C`

Concept

IP addresses

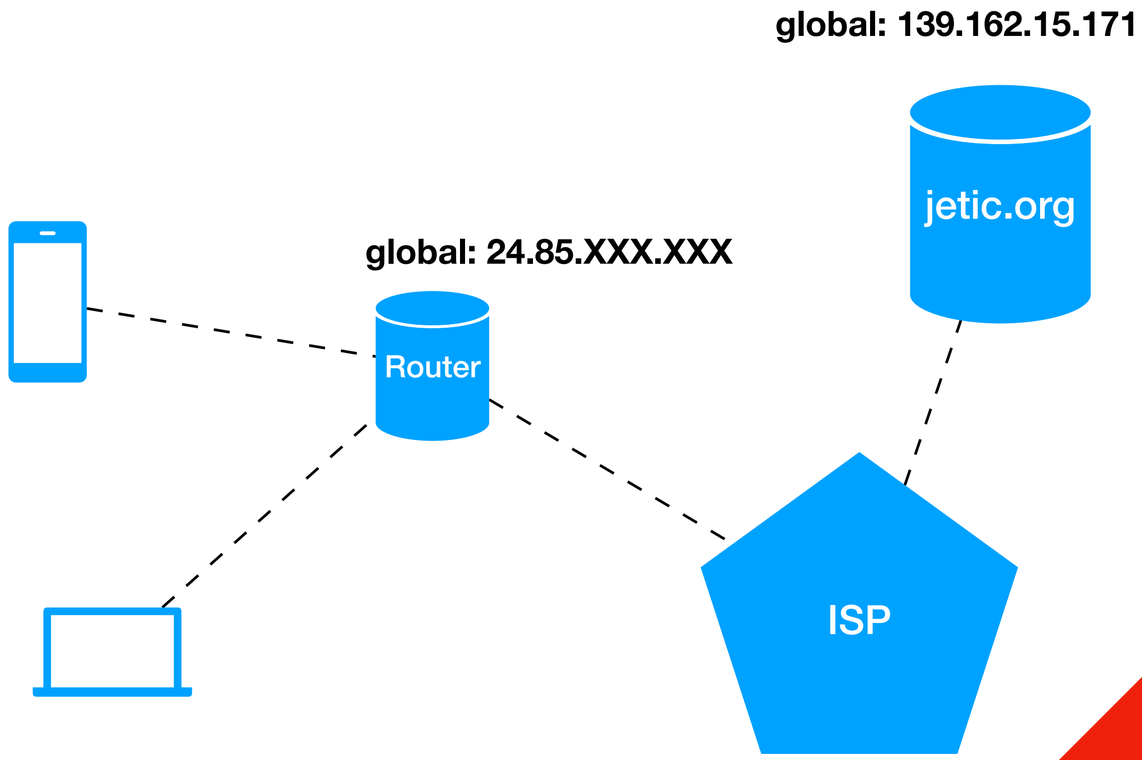
- How to acquire an IP address
  - Static: you know your IP address, e.g. you bought it from an ISP
  - Using DHCP service
    - e.g. your router will use DHCP to assign you a **local IP**

Concept

P1
Communications

local & global IP addresses

- ISP typically assigns global IP using DHCP
  - Static IP: I bought mine, so for `jetic.org` it is static

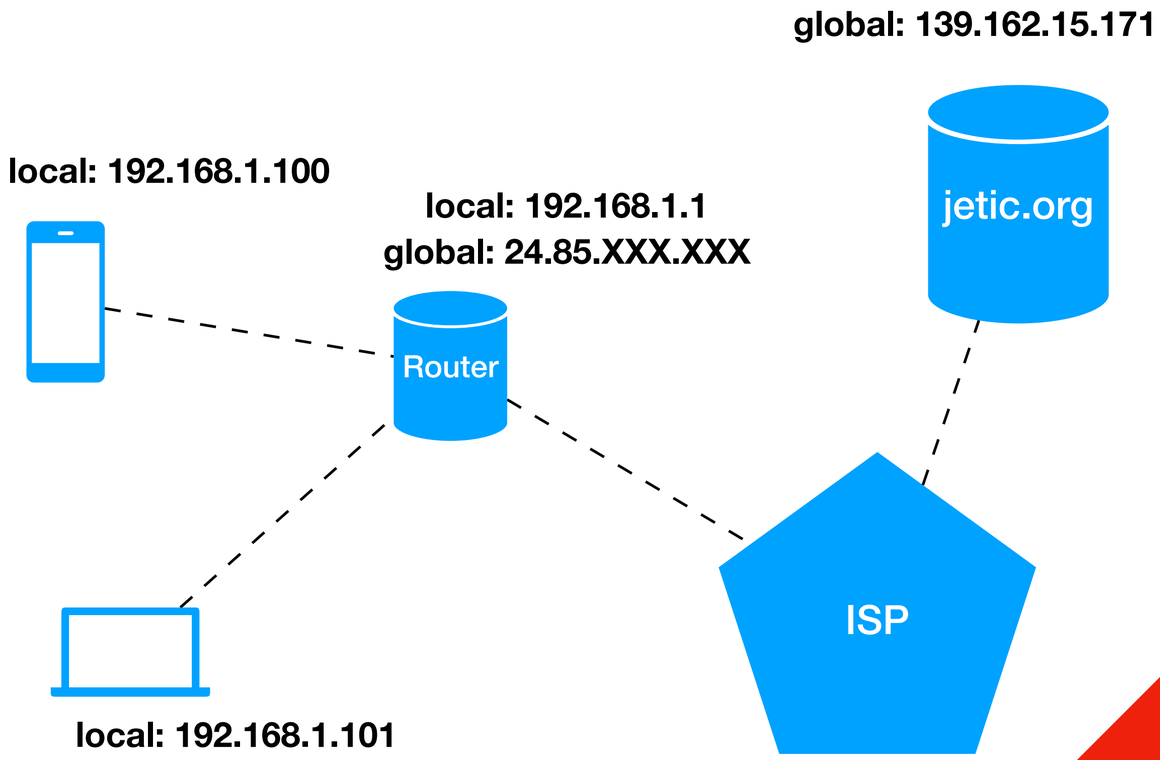


Concept

P1
Communications

local & global IP addresses

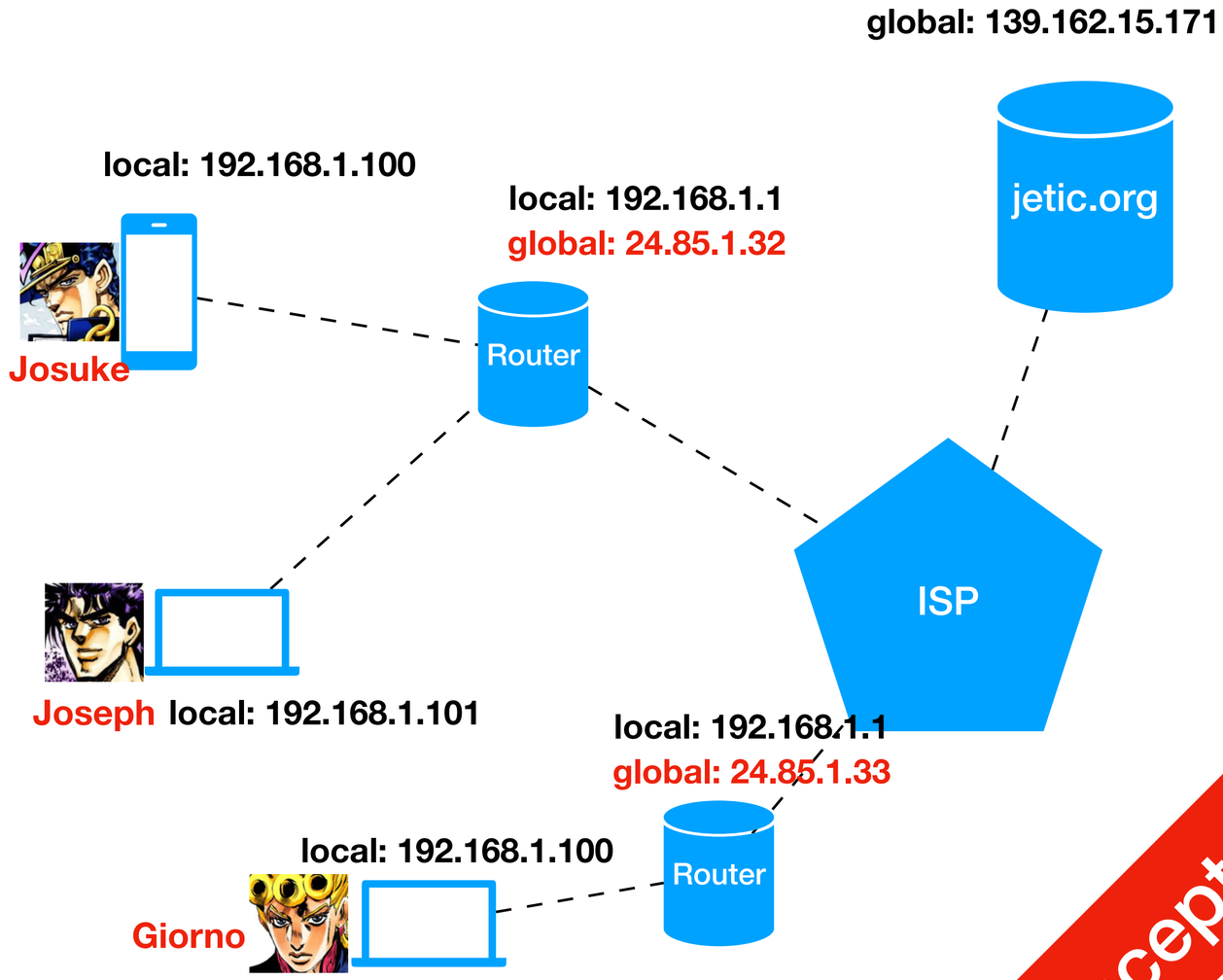
- Your router creates a **local area network**, for which it is the DHCP server
  - e.g., it has the local IP 192.168.1.1
  - It assigns local IP addresses to your devices, e.g. your phone and laptop



Concept

P1
Communications

local & global IP addresses



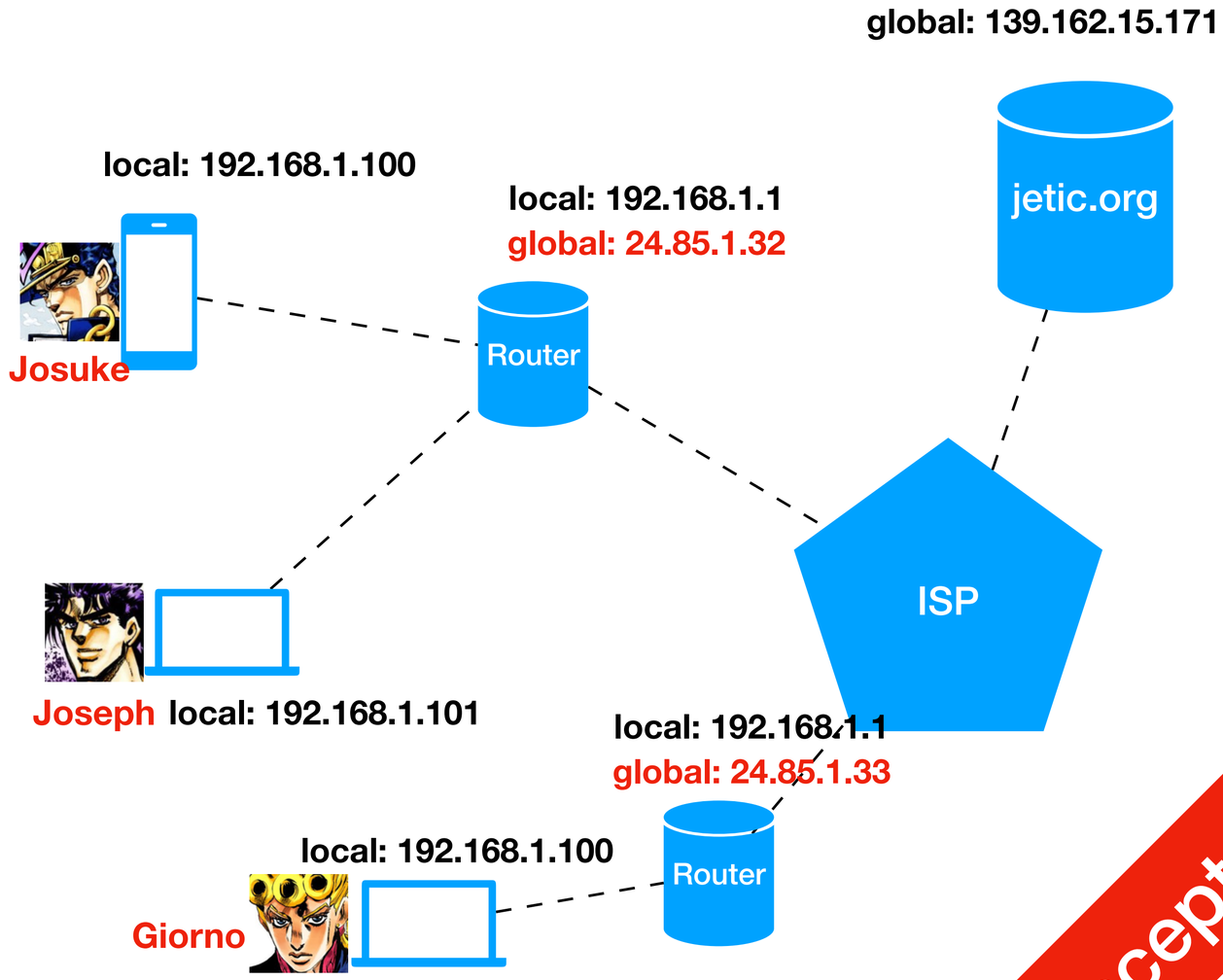
1. It's complicated

Concept

P1
Communications

local & global IP addresses

- All devices in this network have unique IP addresses



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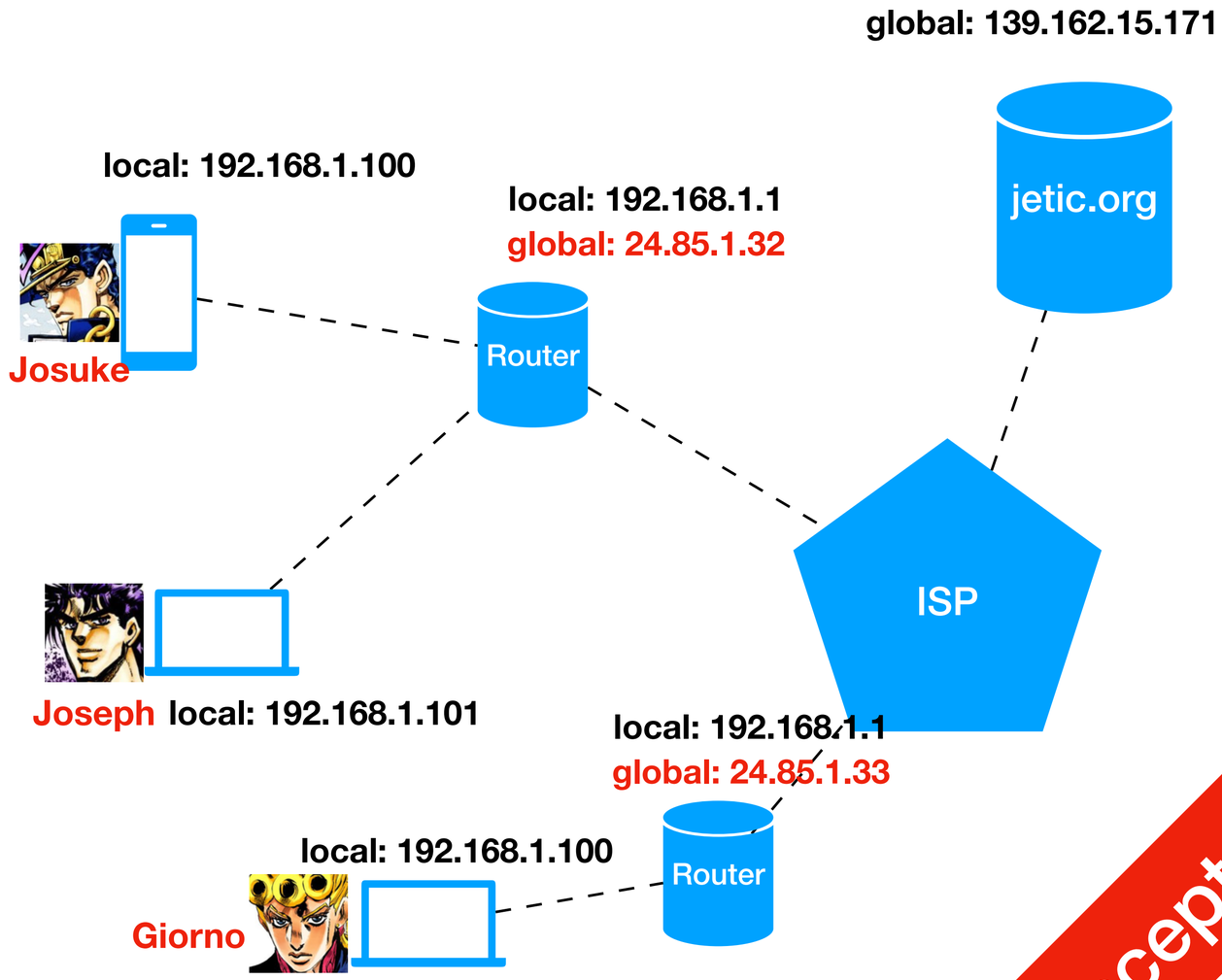

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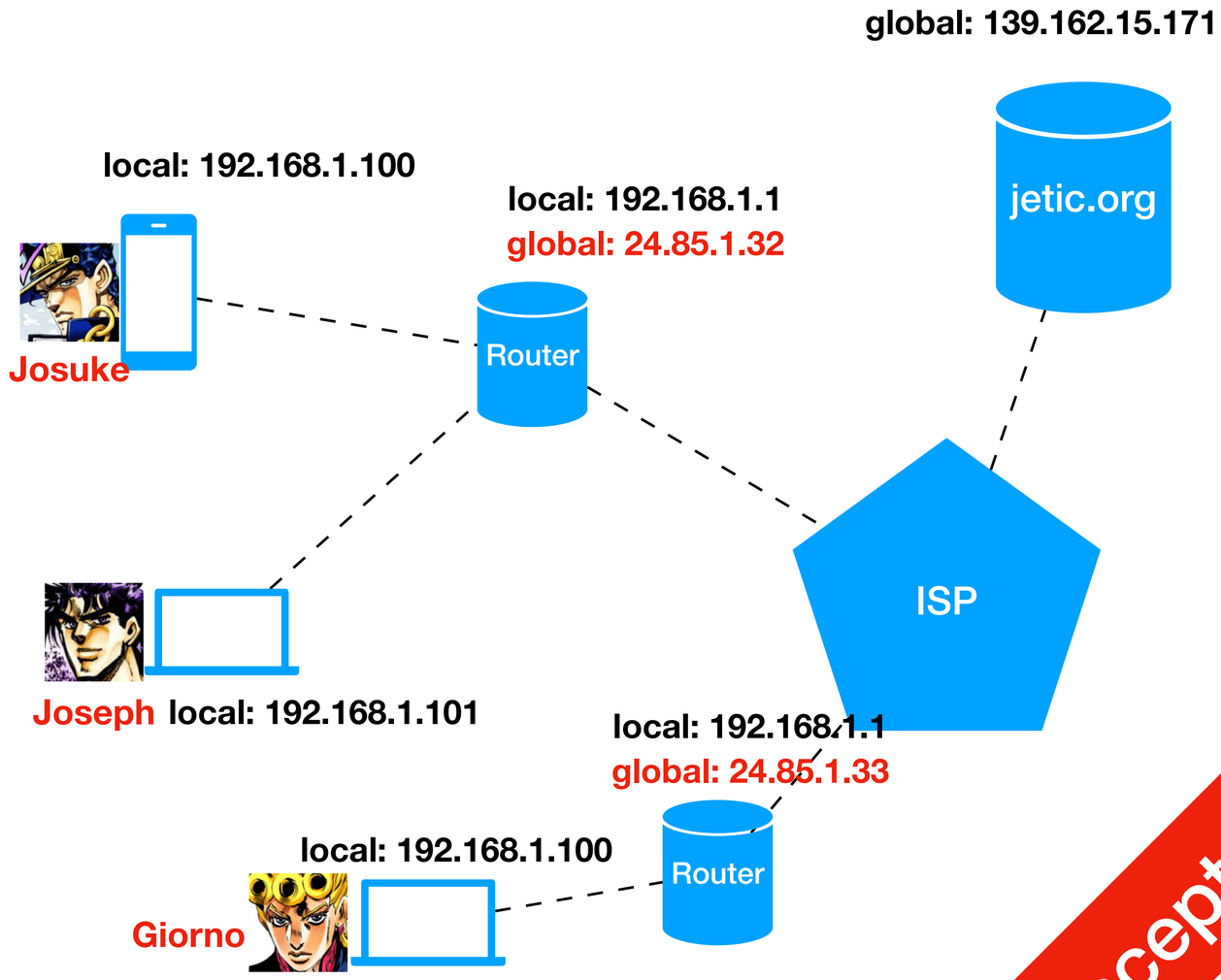

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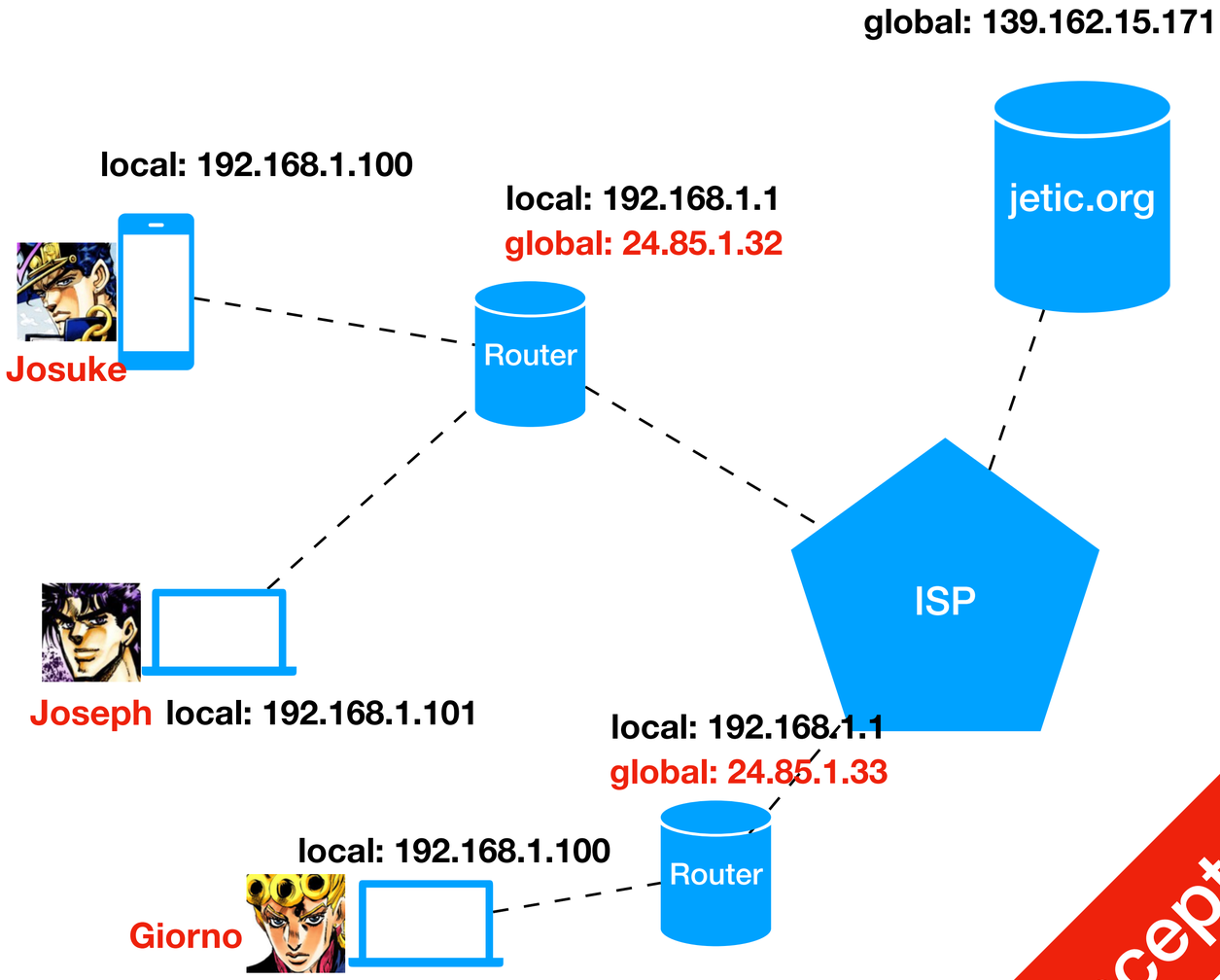

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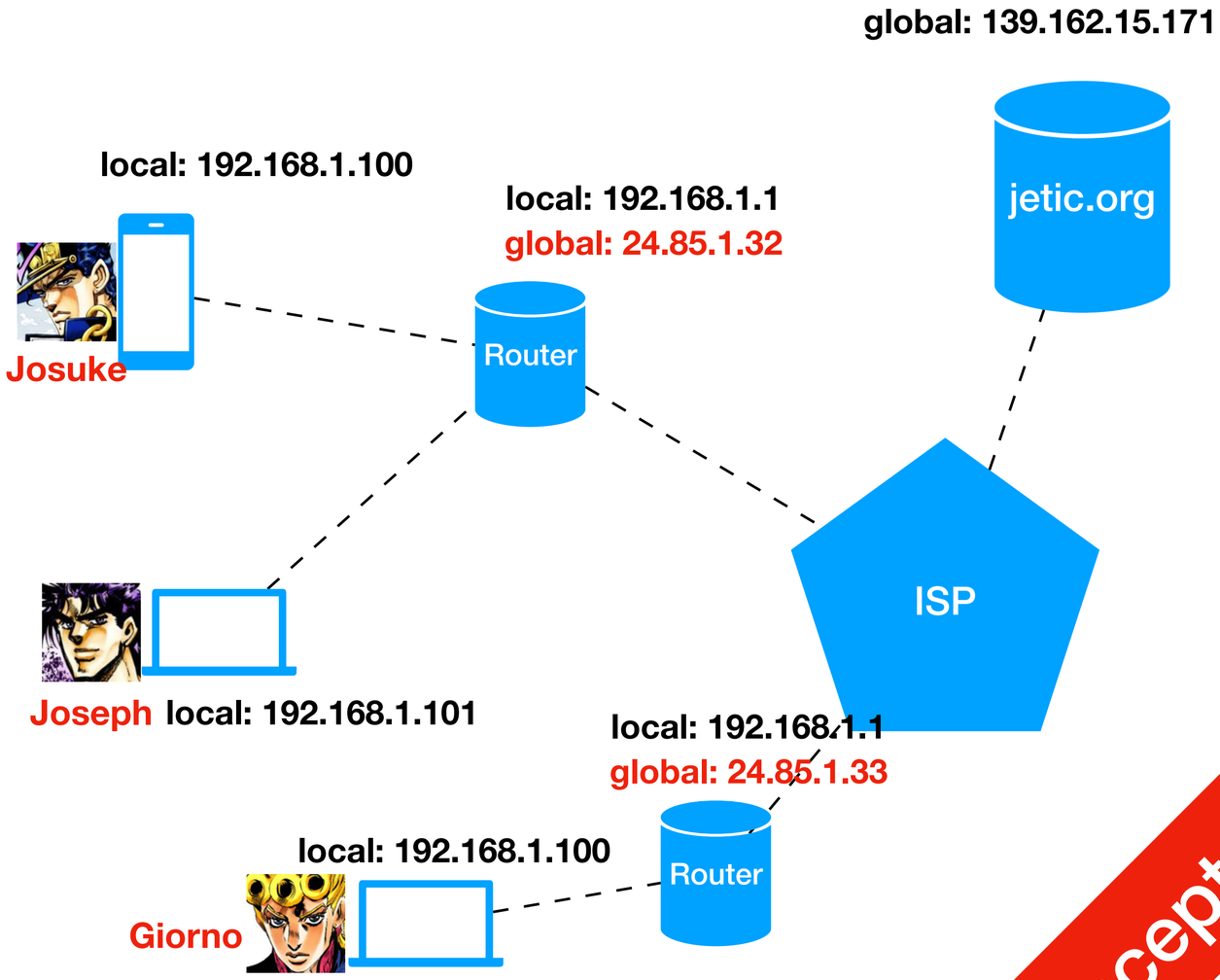

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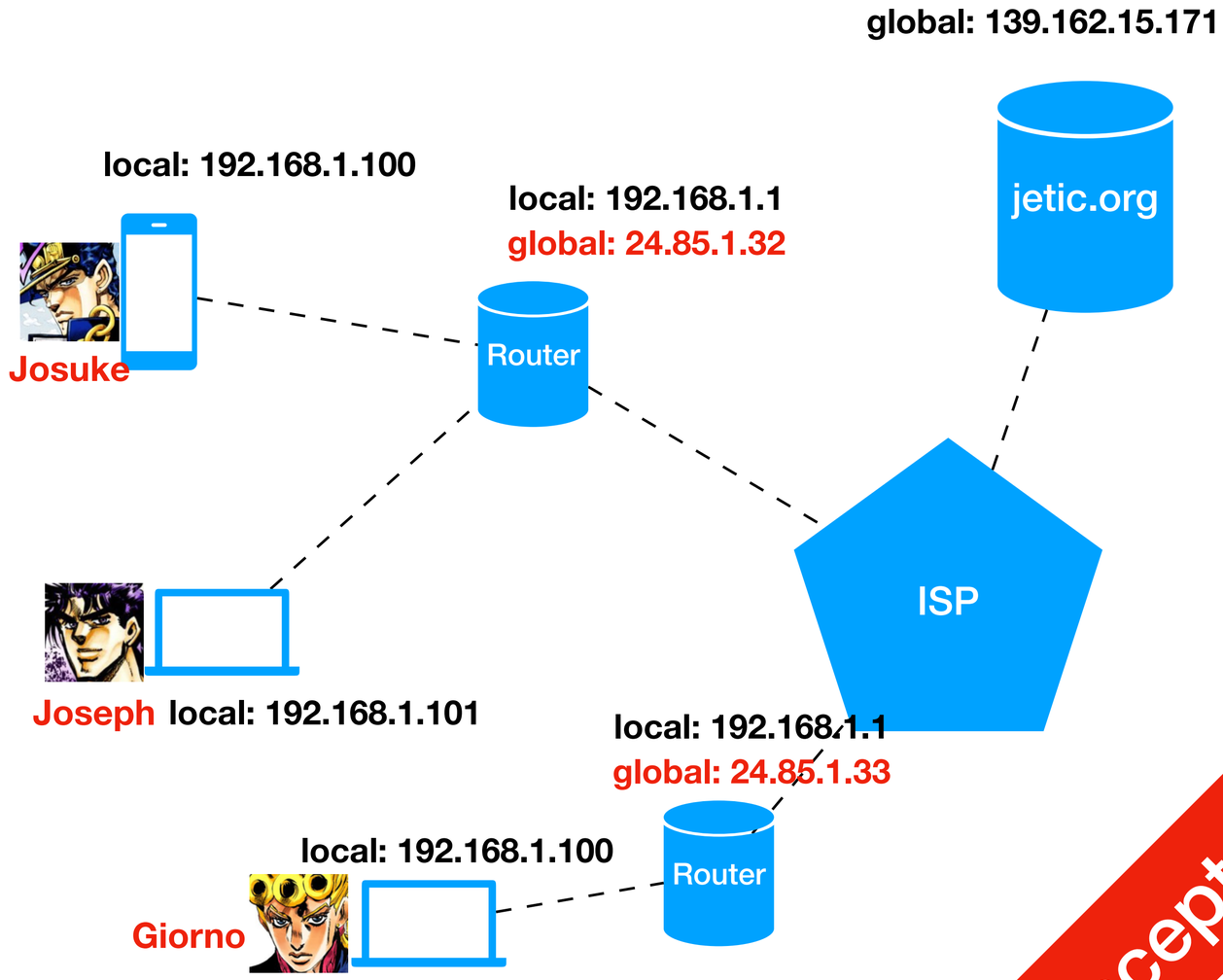

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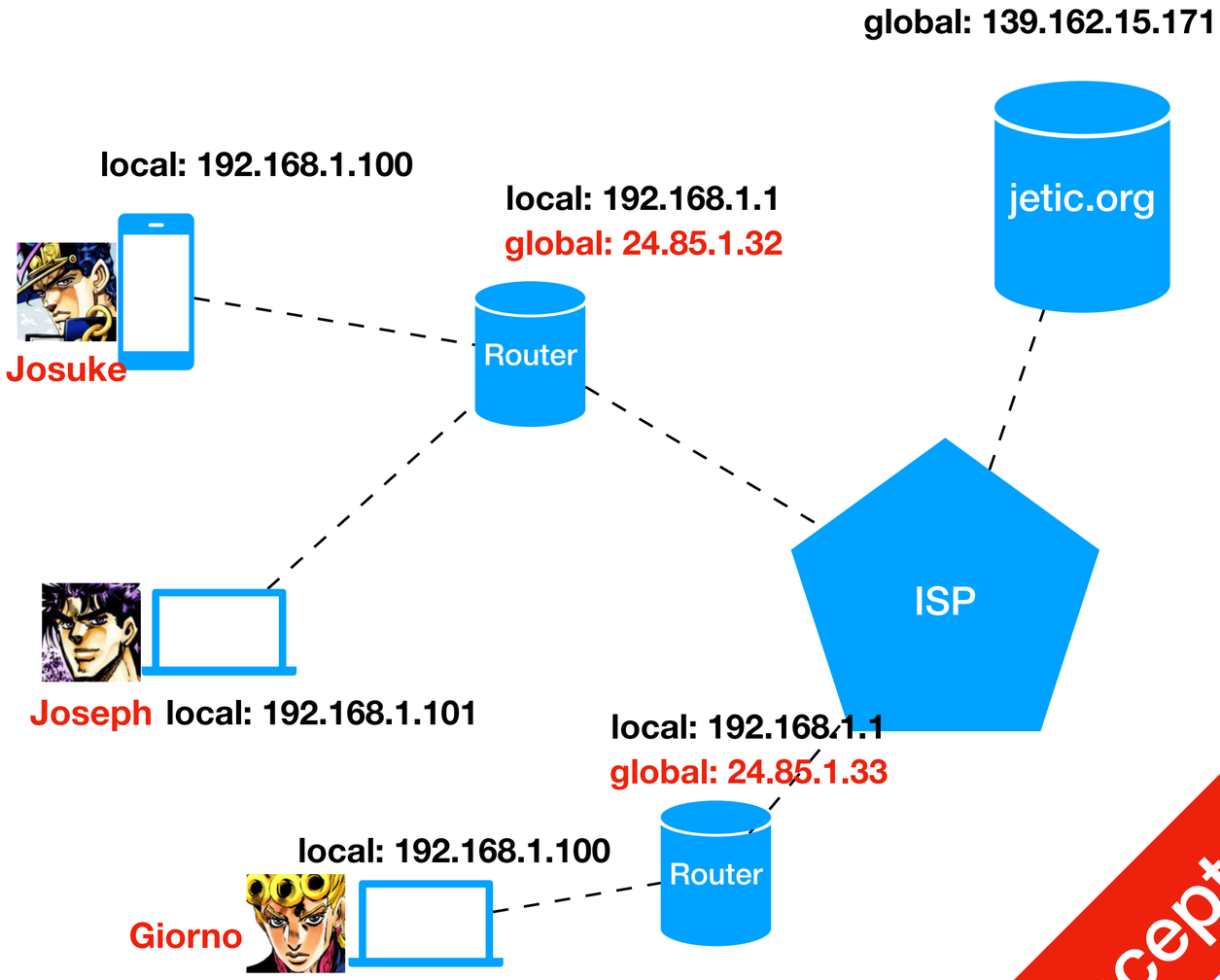
  - Through **Gateways**
    e.g. your router can be your gateway



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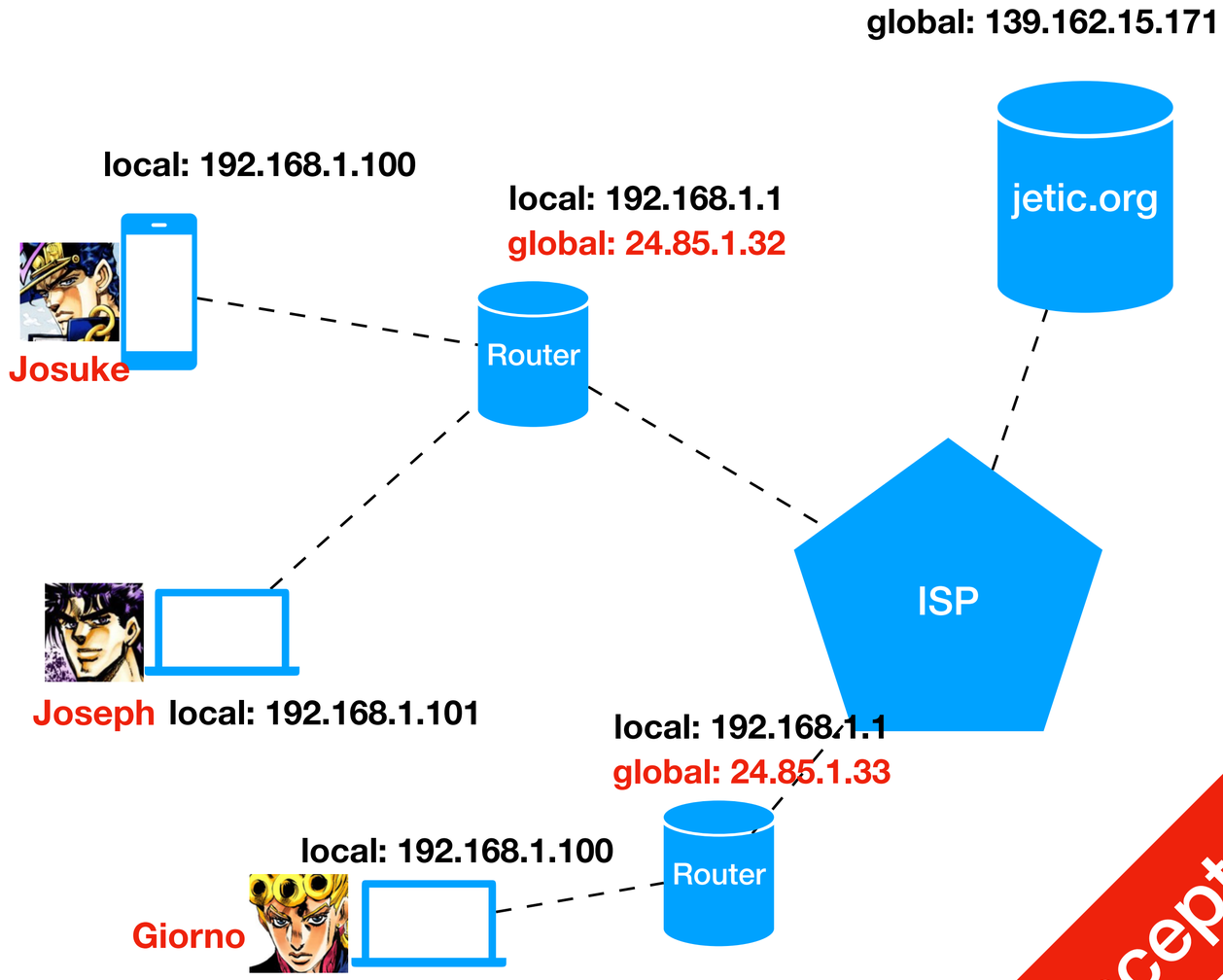

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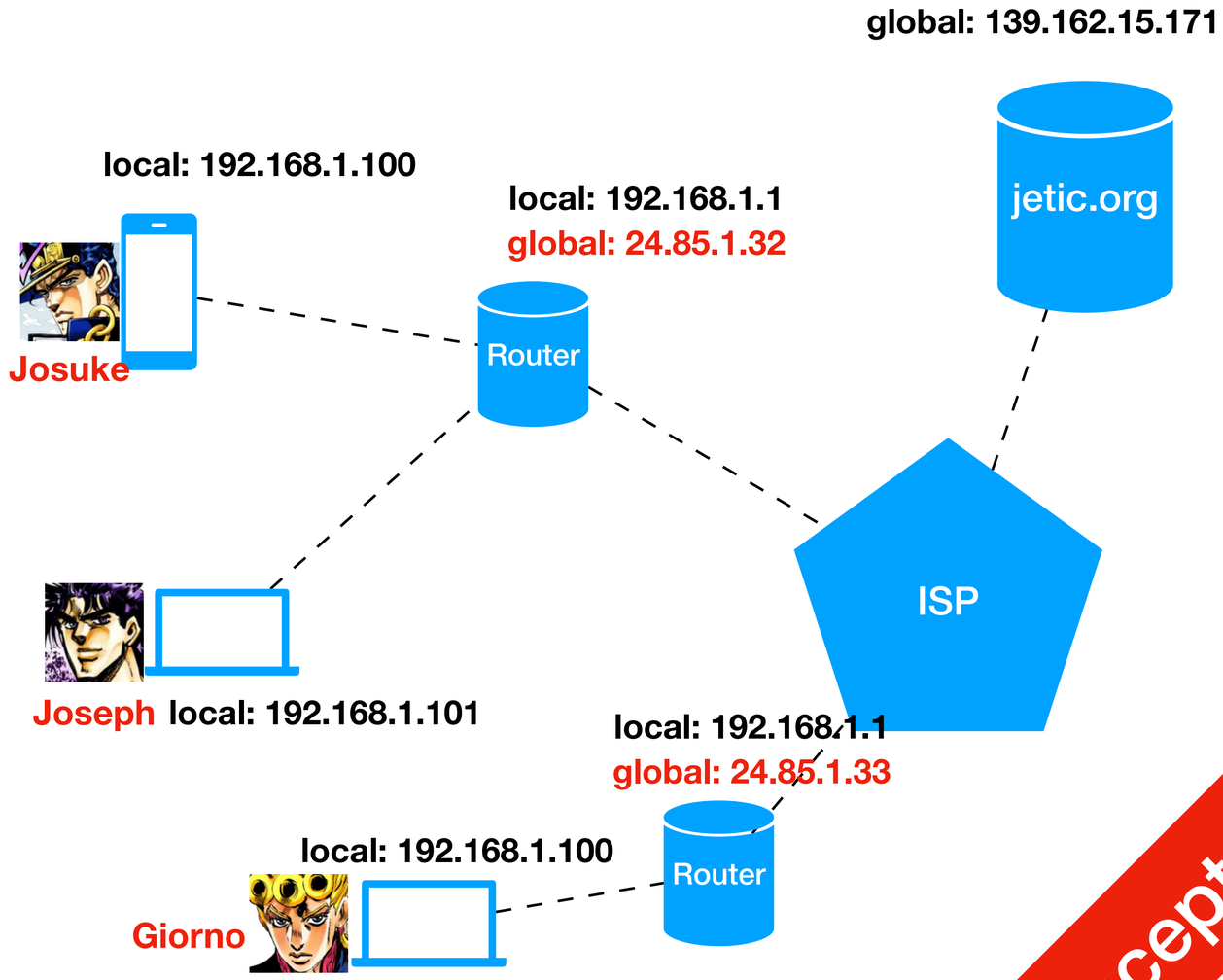
  - Nope, we are not talking about it.[1]



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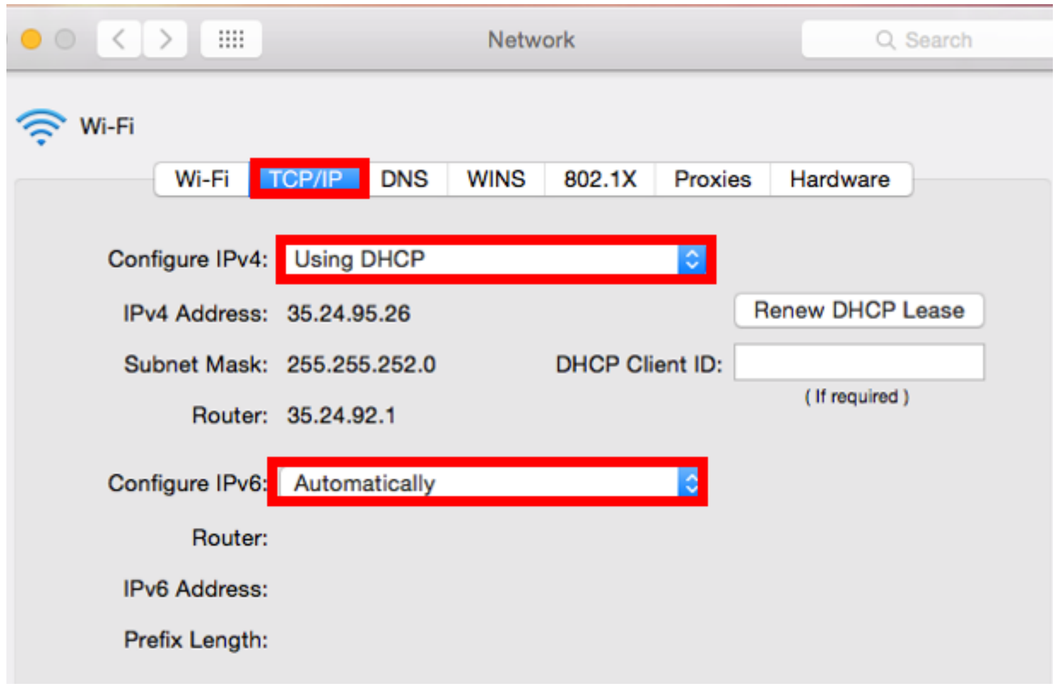


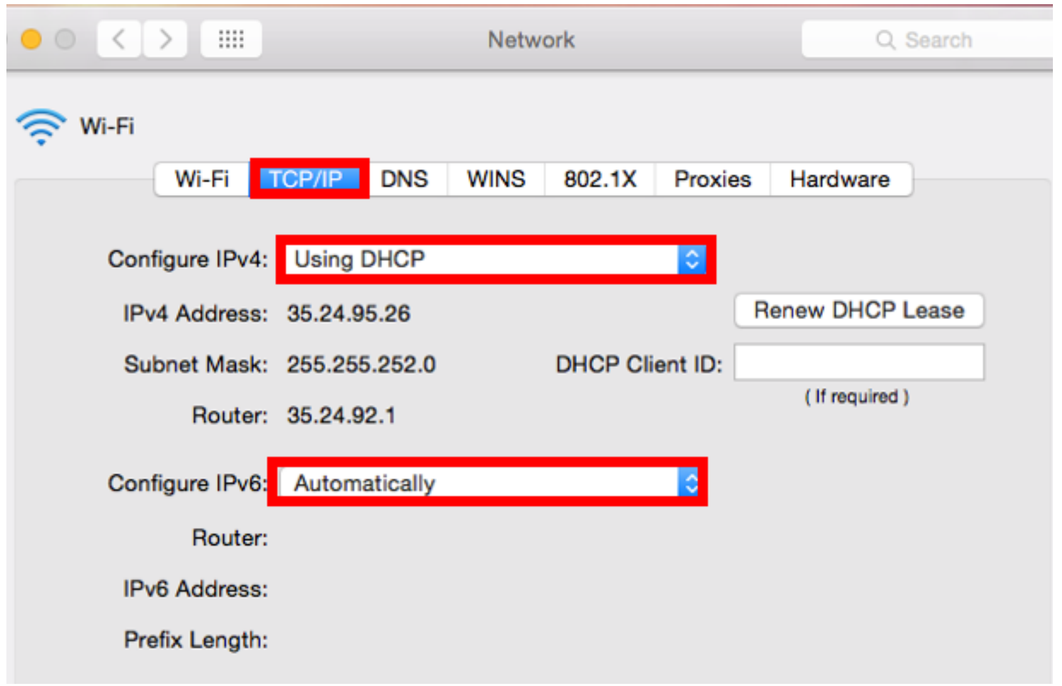
Concept

1. Not required for this course

P1
Communications

local & global IP addresses

- This is an example



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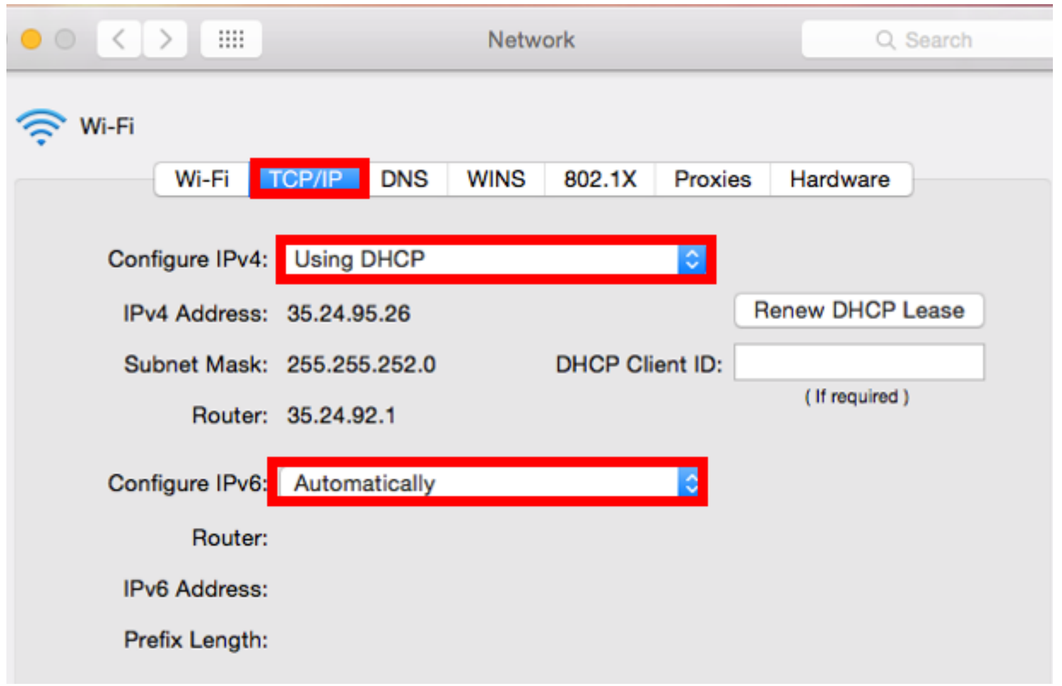
P1
Communications

local & global IP addresses

- This is an example
  - **Subnet Mask** (Binary)[1]
    tells you the range of IP address
    that belongs to this local network



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P1
Communications

local & global IP addresses

- This is an example
  - **Subnet Mask** (Binary)[1]
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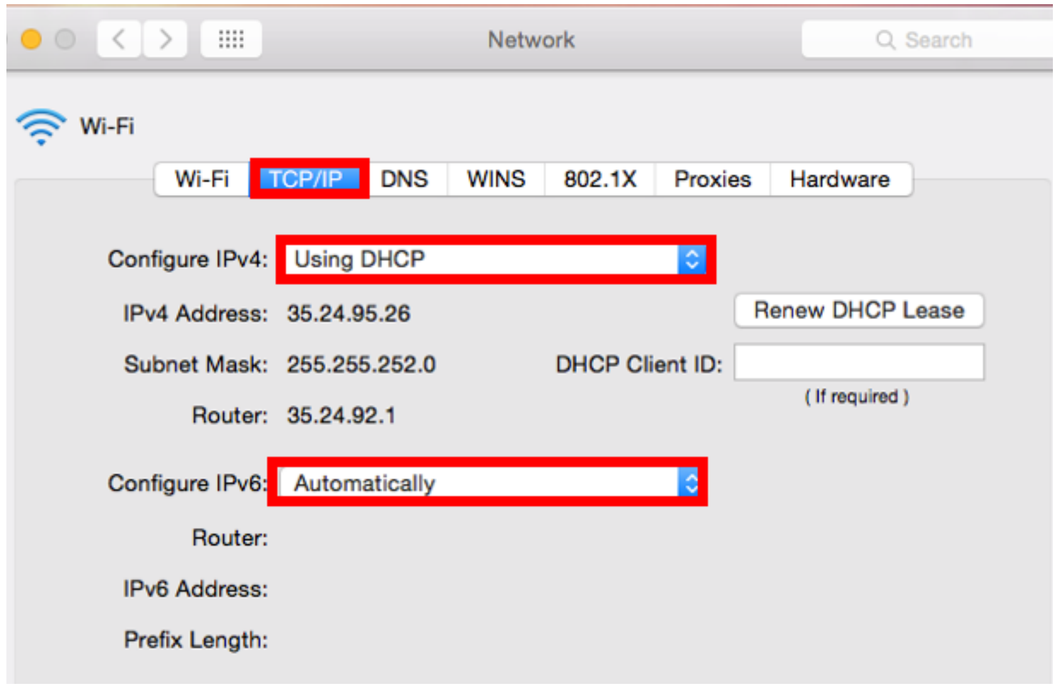
  - DHCP assigned IP address needs
    to be **renewed periodically**
    This can be set on your router



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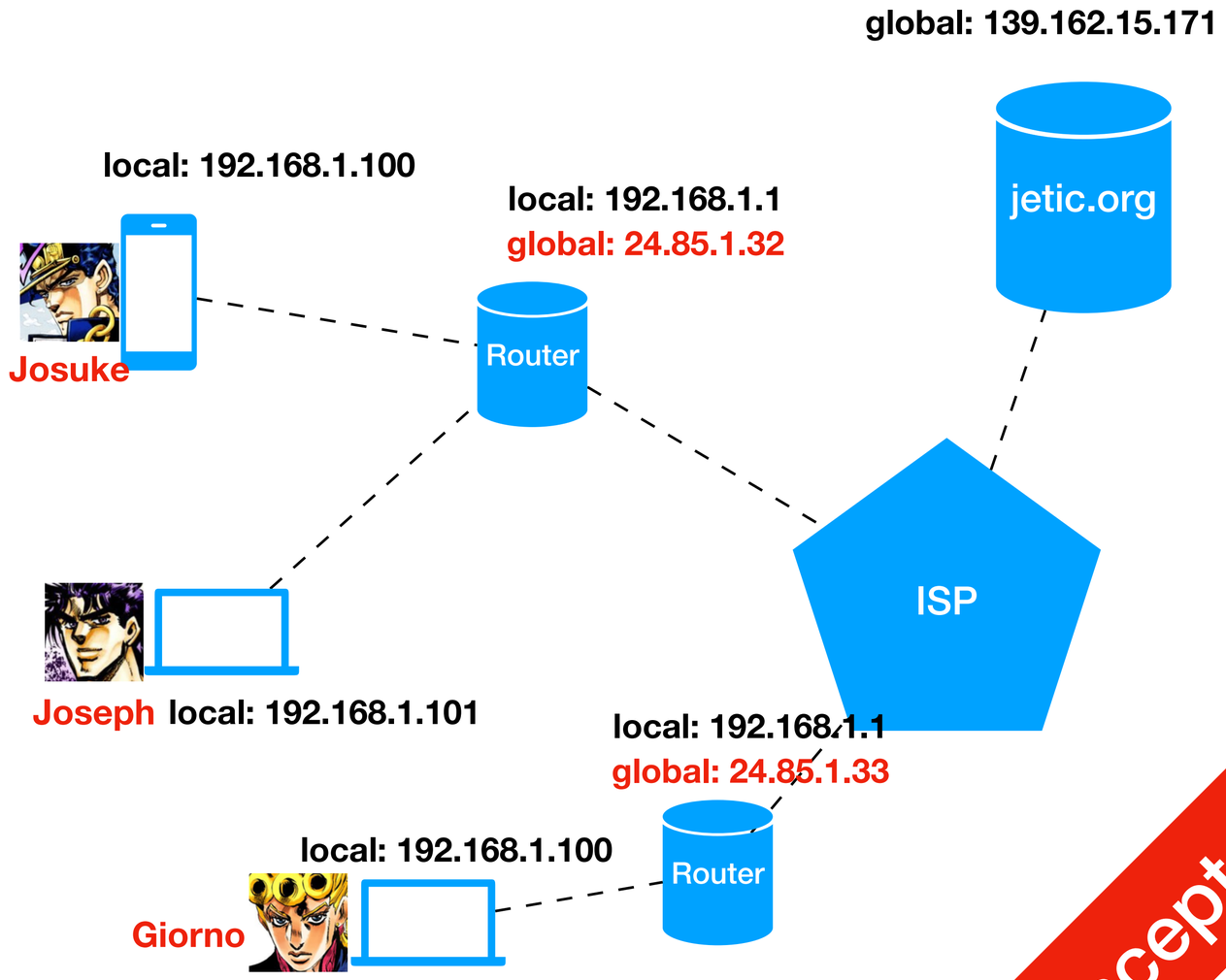
Gateway (Simplified)



Concept

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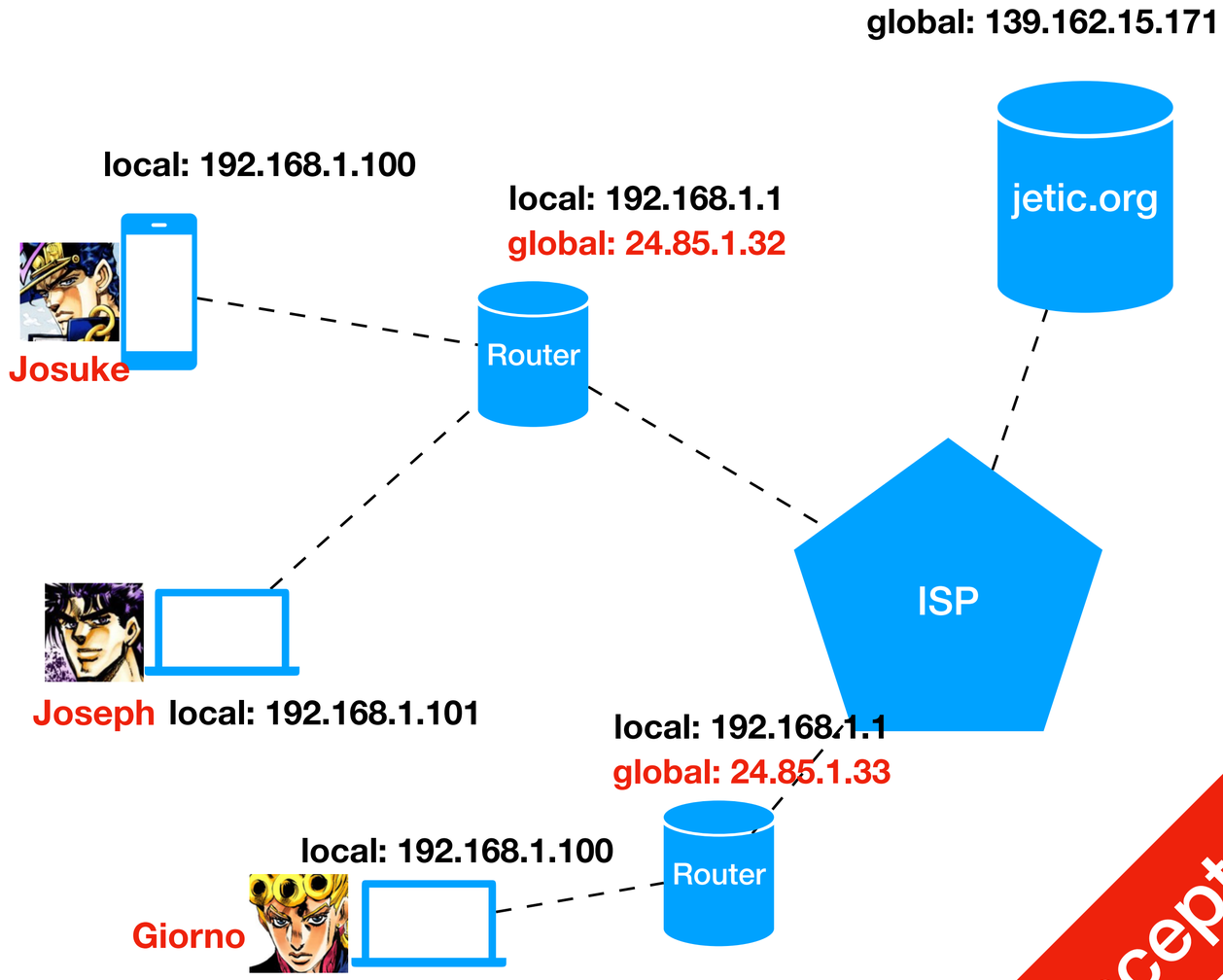

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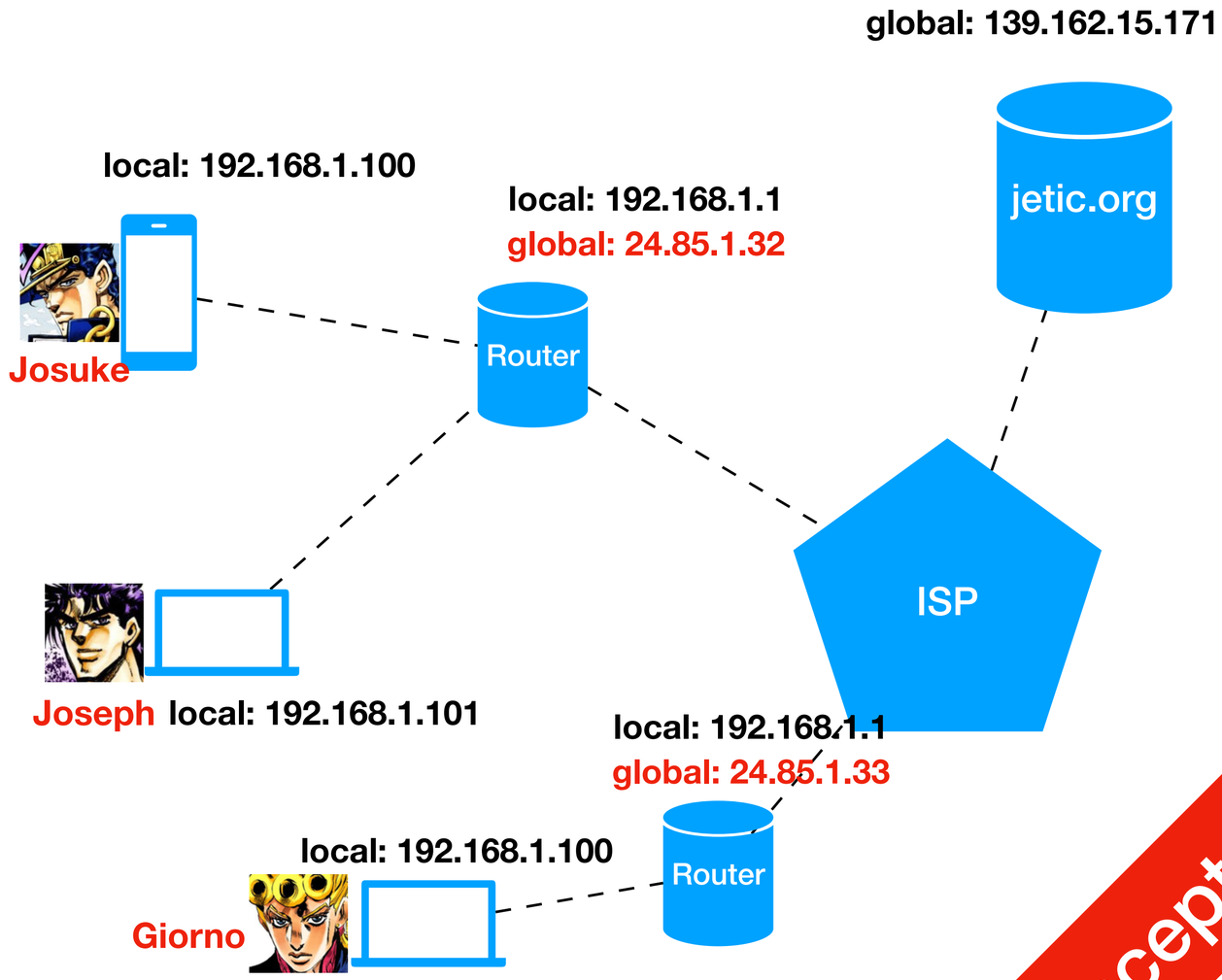

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Gateway (Simplified)

- So how do **Josuke** receive packets from jetic.org?
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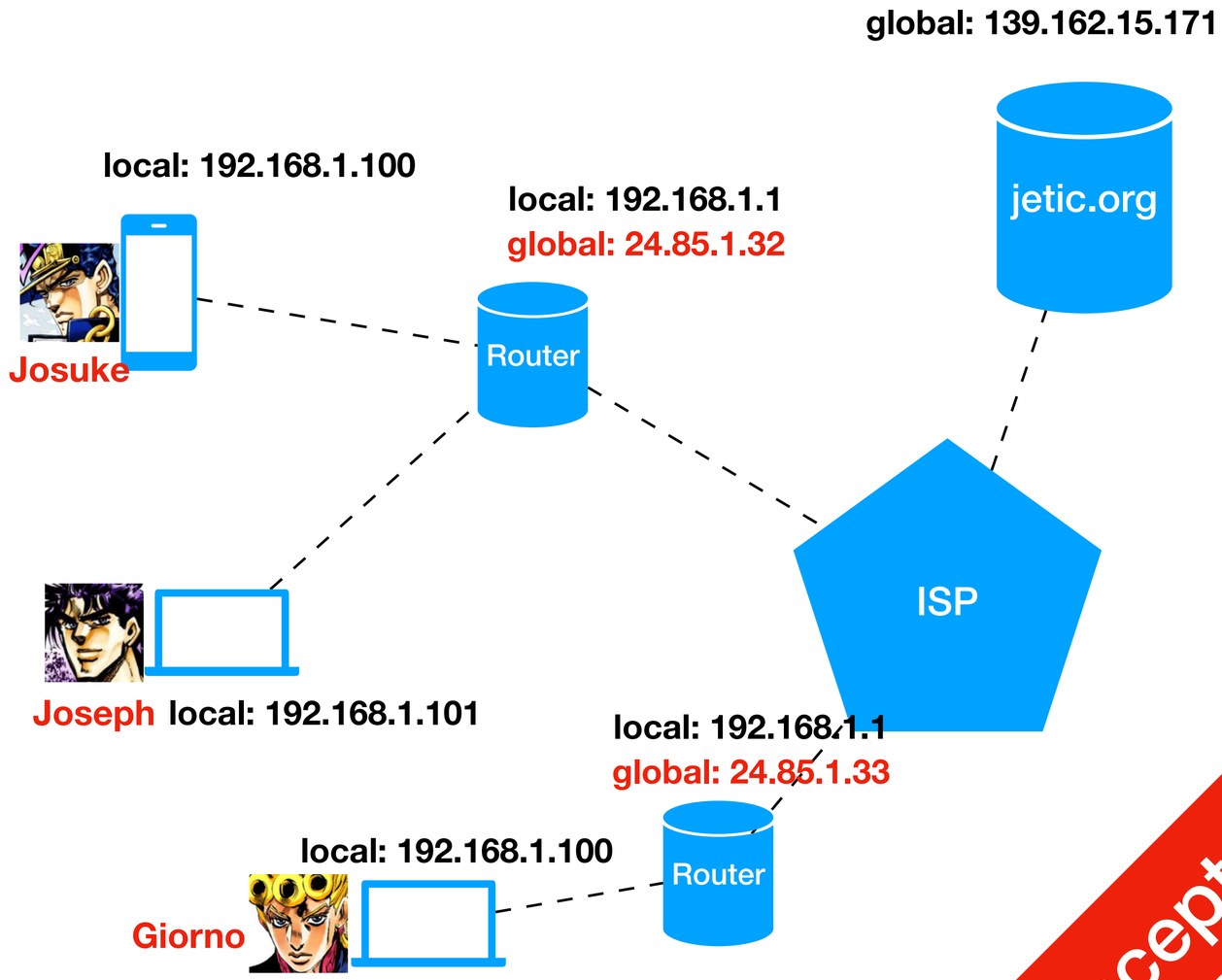
  - The Gateway devices will figure out which packet is for whom

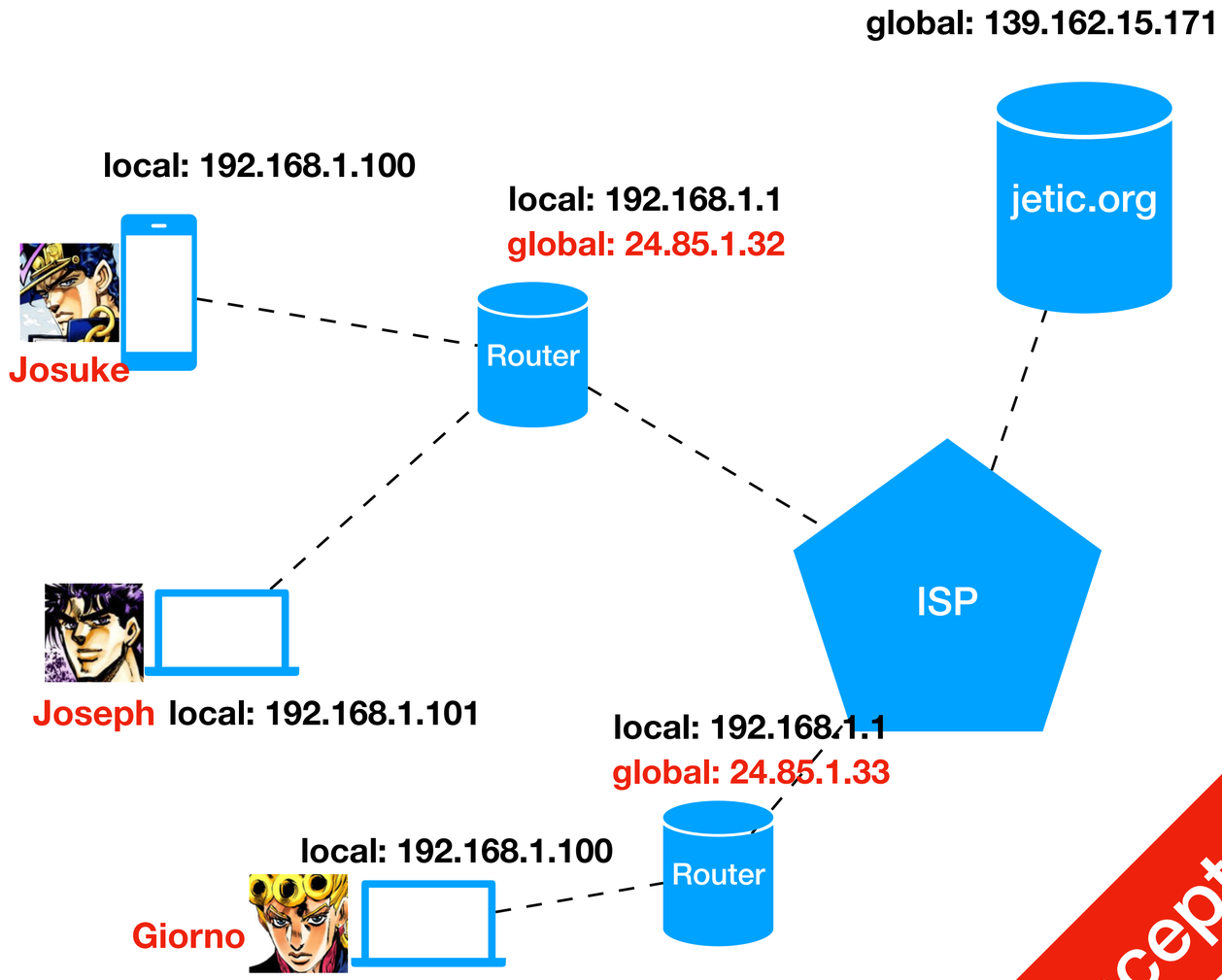


Concept

P1
Communications

Gateway (Simplified)

- So how do **Josuke** receive packets from jetic.org?
  - Through **Gateways (e.g. router)**
  - The Gateway devices will figure out which packet is for whom
    - e.g. distinguish between packets **to** **Joseph** and **Josuke**



Concept

The Evolution of Human Race in Age of Internet Cont.

Summary

P2
Evolution

What makes the Internet so revolutionary?

- Automation
- Detachment
- Untraceable

Review

P2
Evolution

Detachment

- Are instant messages really instant? 
- Polarised public opinions
  Is internet encouraging free speech or censoring it? 
- Service detachment
  "Inhumane" automation of services 

Review

P2
Evolution

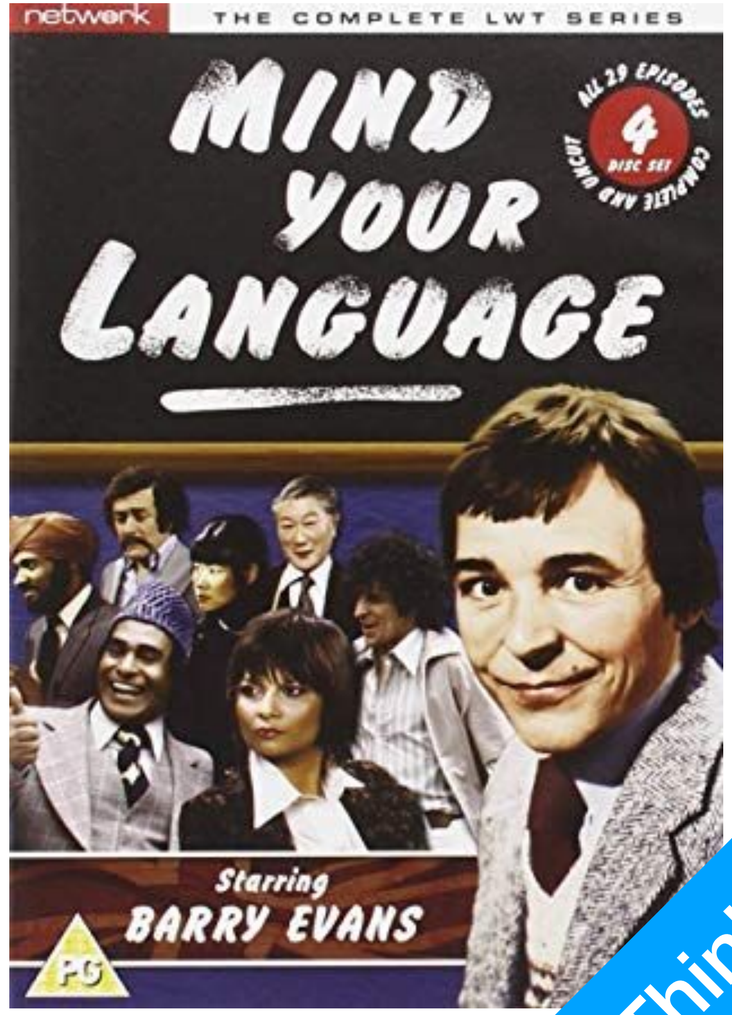
Detachment

- Have you gone out a day without internet? 
- How frequent do you check your phone?
- When’s the last time you ate with friends WITHOUT ever checking your smartphone?
- Have you ever broken up with someone over SMS/Social Media?
- Have you ever had "read but no reply"?
- How often do conversations start/end with memes?

Think

P2
Evolution

Detachment



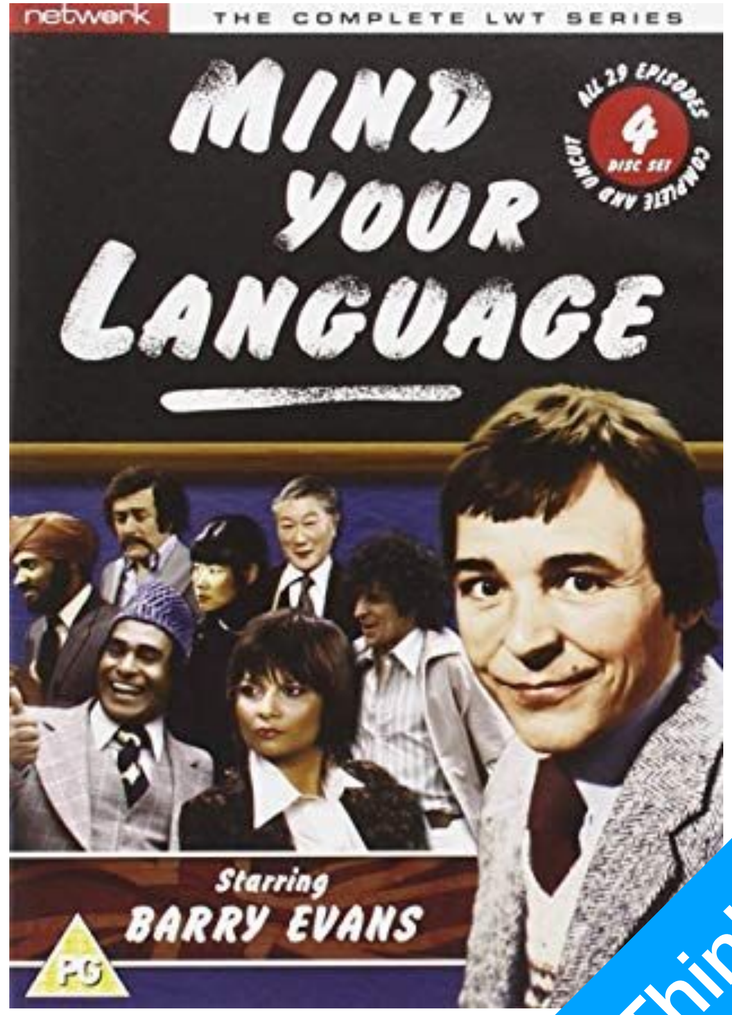
Think

1. Watch Mind Your Language on youtube, do you think this show would have been made in 2020?

P2
Evolution

Detachment

- Do you make your own choices?



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P2
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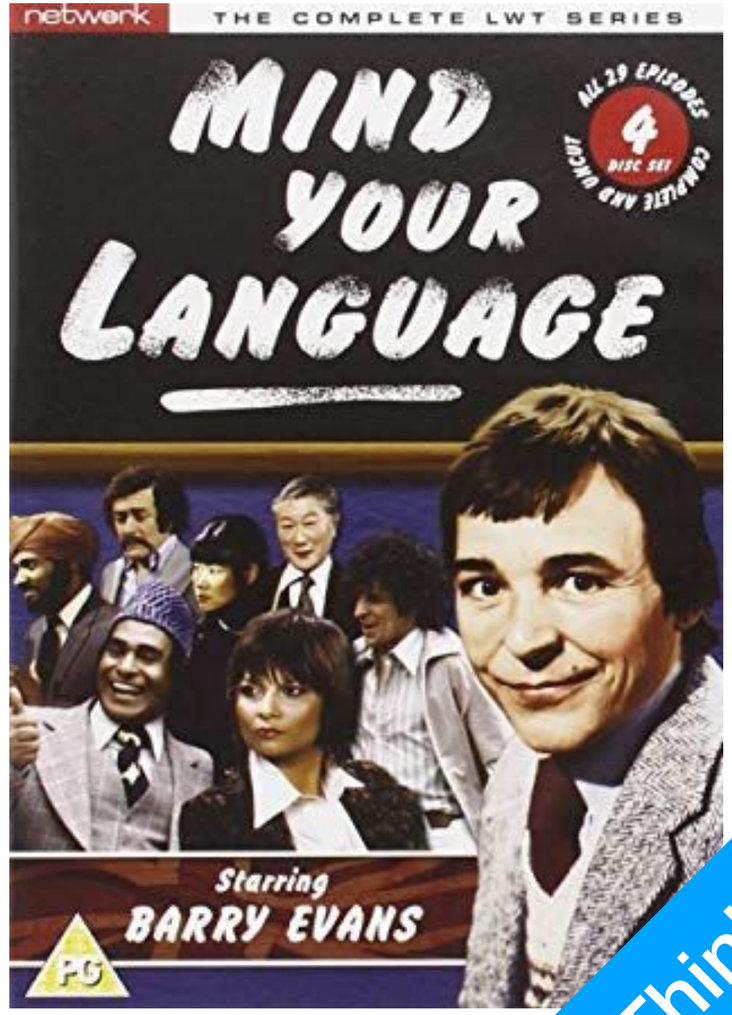
- Do you make your own choices?

- Do you really make your own choices?
  Think about the bad things you've heard about Trump and Joe Biden. Are those sources really reliable?



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- Do you make your own choices?
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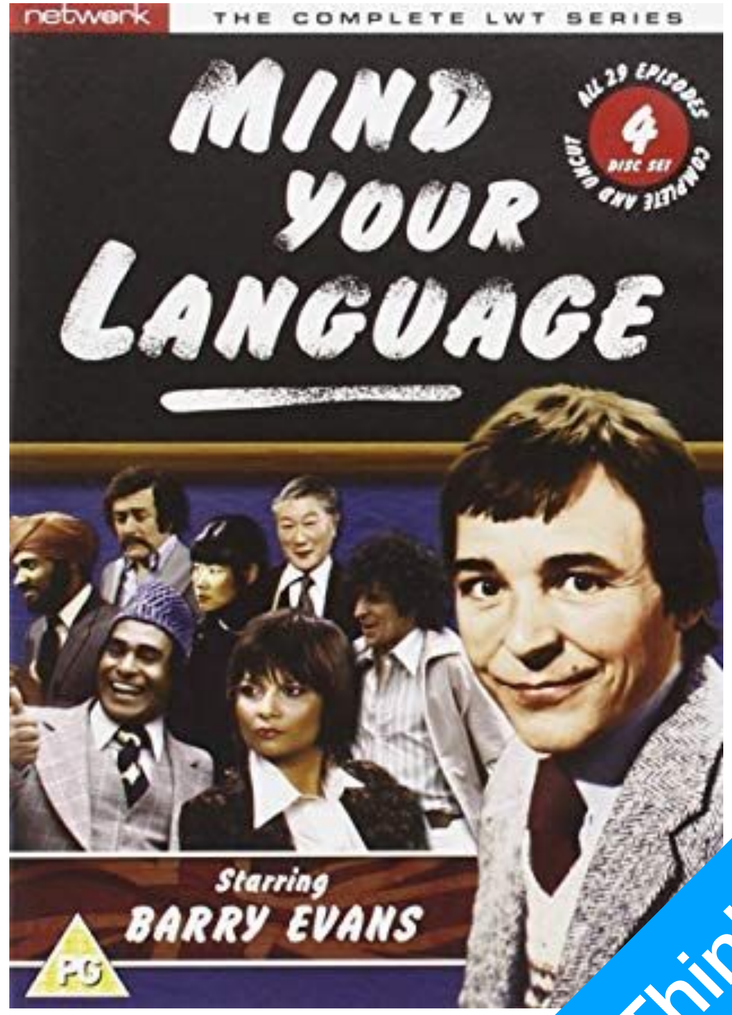
- What do you think about Political Correctness?



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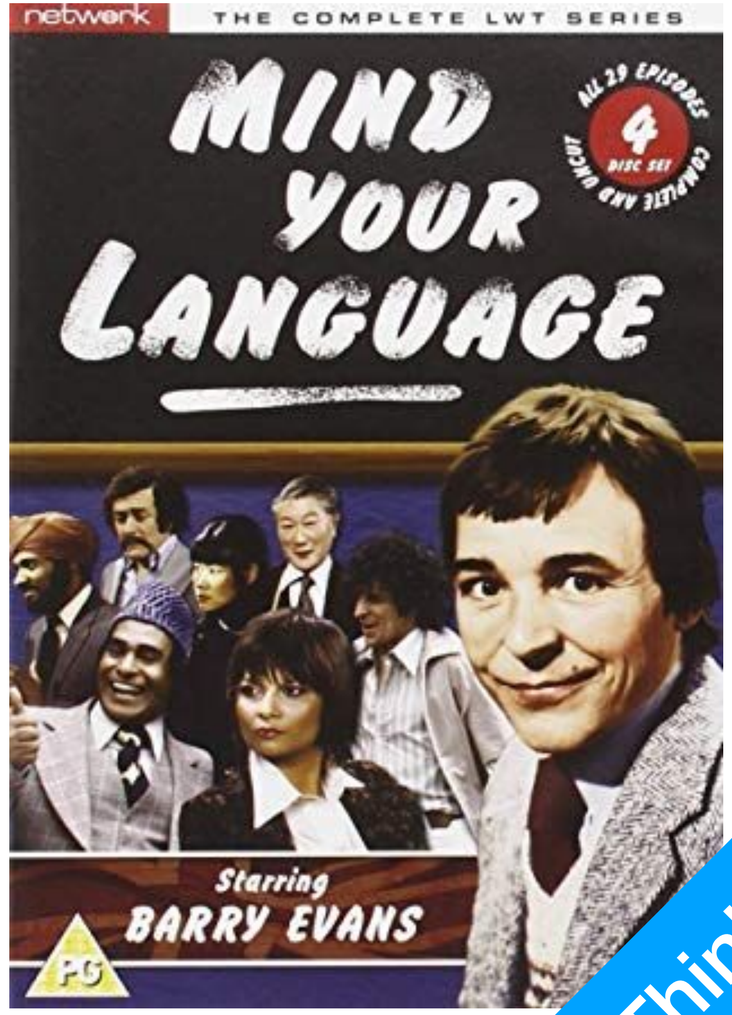

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P2
Evolution

Detachment

Think

P2
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- Have you tried Fido’s customer service?

Think

P2
Evolution

Detachment

- Have you tried Fido’s customer service?
- What do you think about online counselling?

Think

P2
Evolution

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- Ever heard of Salesforce? 

Think

P2
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Think

P2
Evolution

Untraceable

- Blockchain and Cryptocurrencies 
- Cyberbullying and Privacy 
- Darknet 

Concept

P2
Evolution

The Evolution of Human Race in Age of Internet

Concept

P2
Evolution

The Evolution of Human Race in Age of Internet

- What has the internet changed?

Concept

P2
Evolution

The Evolution of Human Race in Age of Internet

- What has the internet changed?
  - The way we live

Concept

P2
Evolution

The Evolution of Human Race in Age of Internet

- What has the internet changed?
  - The way we live
    - interact with family and friends, entertain, eat, and travel

Concept

P2
Evolution

The Evolution of Human Race in Age of Internet

- What has the internet changed?
  - The way we live
    - interact with family and friends, entertain, eat, and travel
  - The way we work

Concept

P2
Evolution

The Evolution of Human Race in Age of Internet

- What has the internet changed?
  - The way we live
    - interact with family and friends, entertain, eat, and travel
  - The way we work
    - Online businesses

Concept

P2
Evolution

The Evolution of Human Race in Age of Internet

- What has the internet changed?
  - The way we live
    - interact with family and friends, entertain, eat, and travel
  - The way we work
    - Online businesses
    - Intelligent business systems

Concept

P2
Evolution

The Evolution of Human Race in Age of Internet

- What has the internet changed?
  - The way we live
    - interact with family and friends, entertain, eat, and travel
  - The way we work
    - Online businesses
    - Intelligent business systems
  - The way we die 

Concept

P2
Evolution

The Evolution of Human Race in Age of Internet

- Internet is just a tool.
- DO NOT BE A TOOL!

Concept