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An IPv4 address (dotted-decimal notation)

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10101100 . 00010000 . 11111110 . 00000001
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Thirty-two bits (4 x 8), or 4 bytes

IP Addresses

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- That gives 2^{32} possible addresses -- 4,294,967,296 hosts.
- Newer IPv6 address use 128 bits in **hexadecimal notation**.
- That gives 2^{128} possible addresses -- 3.403×10^{38} hosts

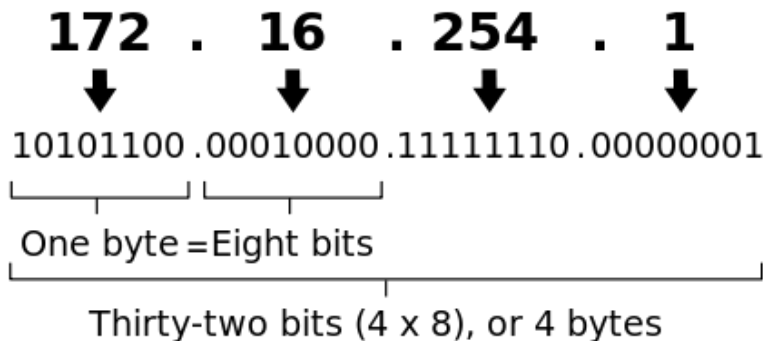
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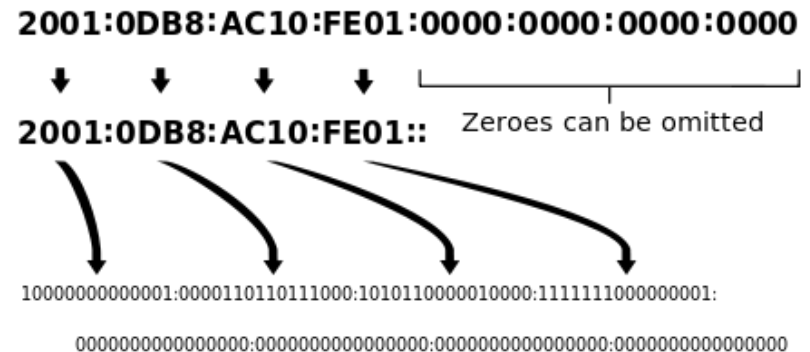
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An IPv4 address (dotted-decimal notation)

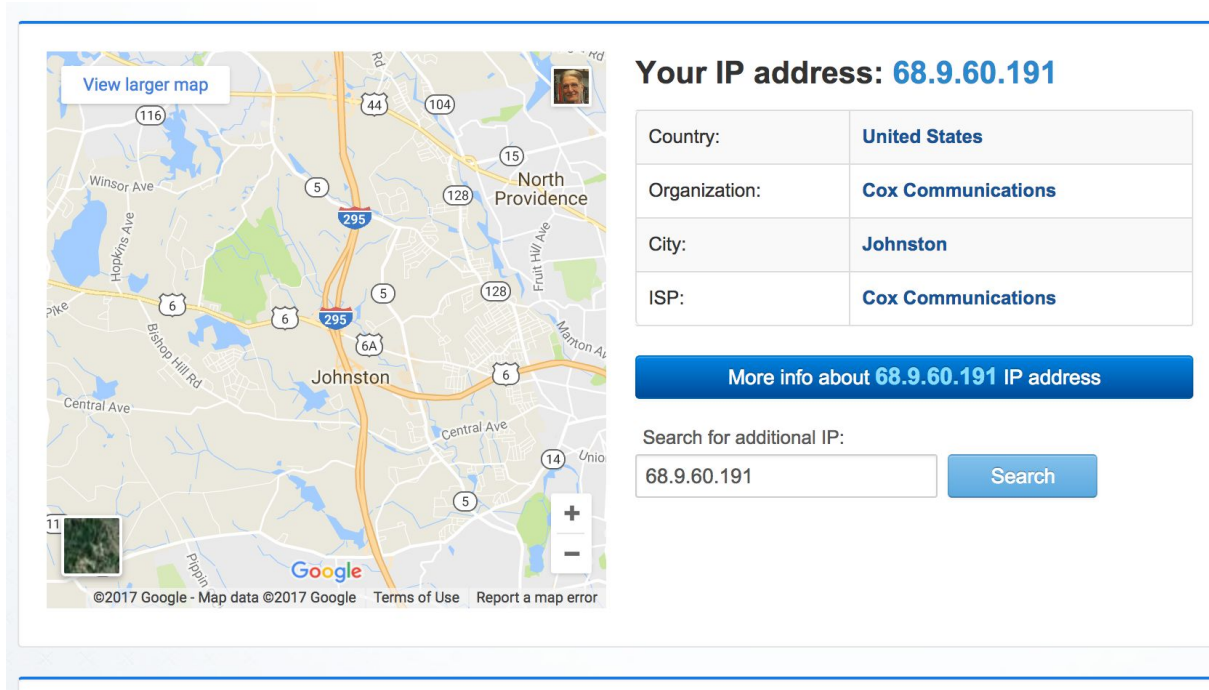


An IPv6 address (in hexadecimal)



Find Your IP Address

- Every device (laptop, smartphone, tablet, etc.) is assigned an IP address **by the service provider** when it connects to the Internet
- Visit www.whatip.com which will provide your IP address and show the location of the service provider that assigns you that IP address.



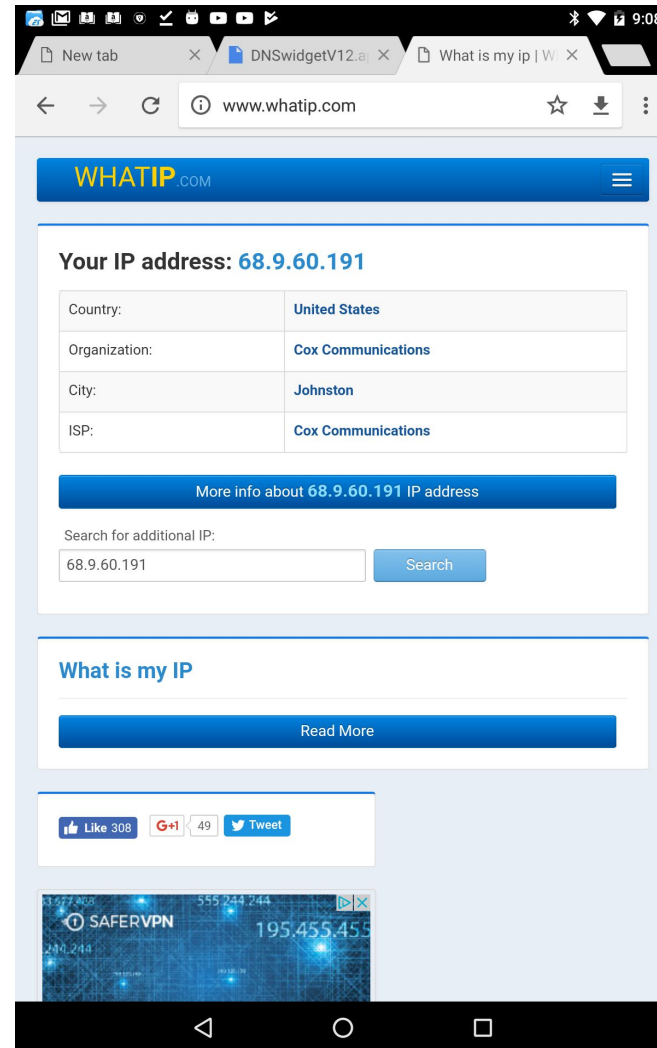
The screenshot displays the website's interface. On the left is a Google Map of Johnston, Rhode Island, with a 'View larger map' button. The map shows major roads like I-295 and I-95, and landmarks like Johnston. On the right, the text 'Your IP address: 68.9.60.191' is shown in blue. Below this is a table with IP details:

Country:	United States
Organization:	Cox Communications
City:	Johnston
ISP:	Cox Communications

Below the table is a blue button that says 'More info about 68.9.60.191 IP address'. At the bottom, there is a search section titled 'Search for additional IP:' with a text input field containing '68.9.60.191' and a 'Search' button.

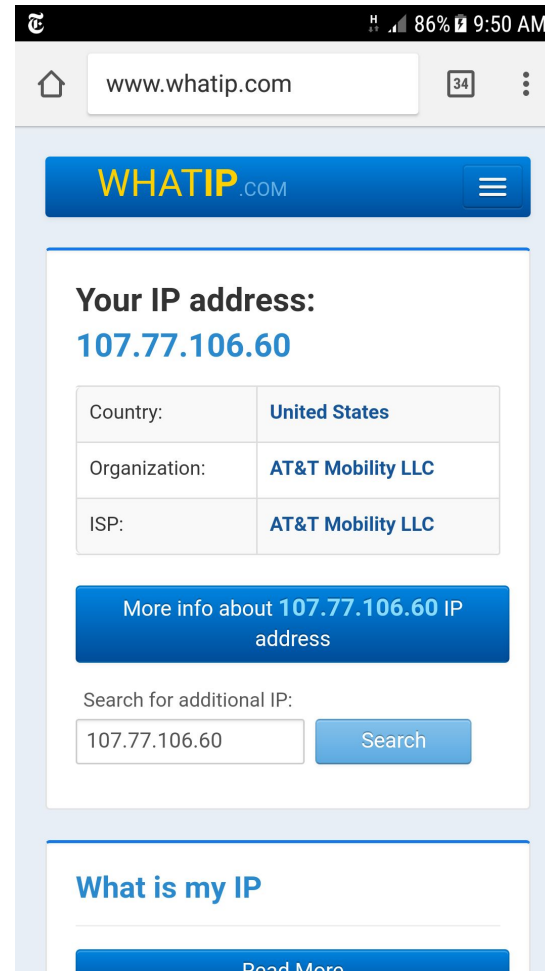
Find Your IP Address

- **Whatip.com** will also work on your mobile device.
- Note again that your device's IP address is assigned by your service provider.
- In this case the provider is still Cox communications because my device is connected to my home's WiFi.



Find Your IP Address

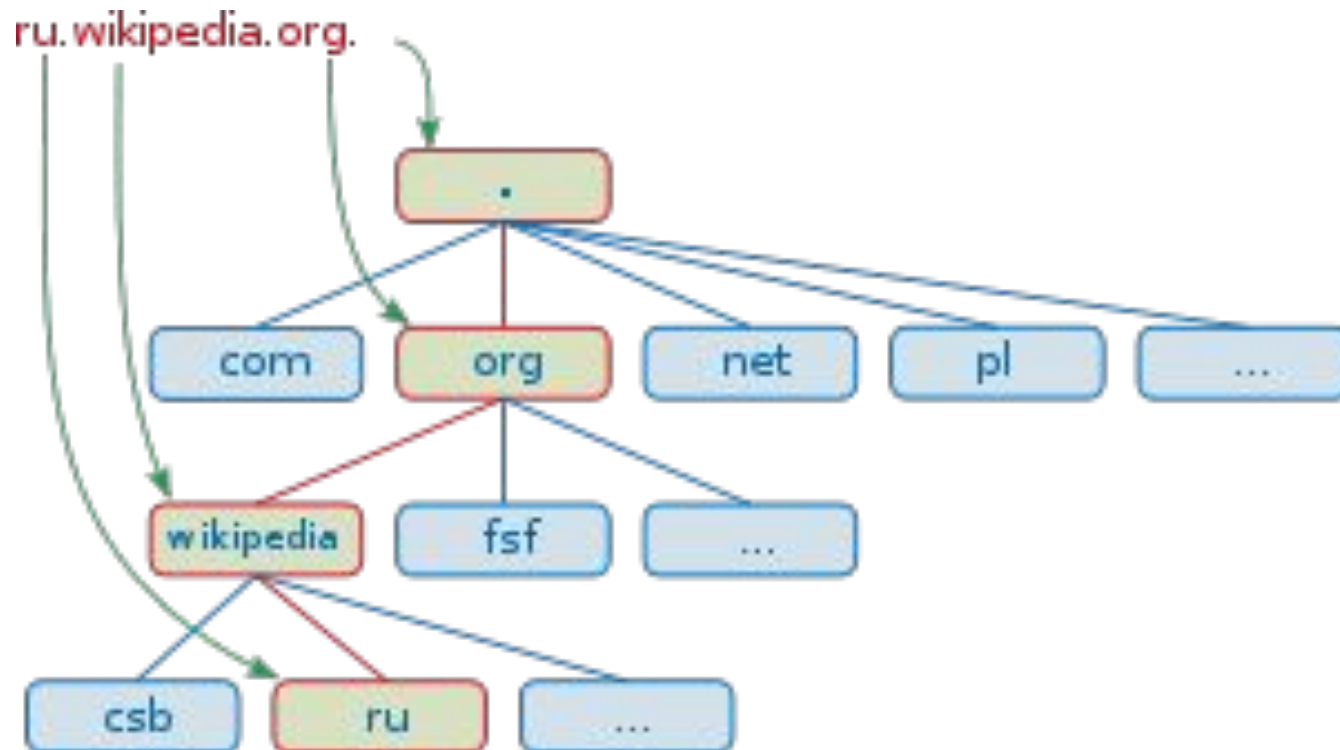
- **Whatip.com** will also work on your mobile device when it is not on Wifi.
- In this case the IP address is assigned by my mobile provider, AT&T.



The Domain Name System

Domain Names

An Internet *domain name* is organized into a hierarchy, as shown, for *ru.wikipedia.org*



Domain Name Service (DNS)

- A domain name takes the following hierarchical form:

[4th level domain] . [3rd level domain] . [2nd level domain] . [top-level domain]

turing . cs . trincoll . edu

- Top-level domain names (edu, com) are not hostnames. They do not have IP addresses.
- A *hostname* is a domain name that is associated with an IP address. For example, these may be **legitimate hostnames** -- if they have an assigned IP address:
 - trincoll.edu
 - www.trincoll.edu
 - turing.cs.trincoll.edu

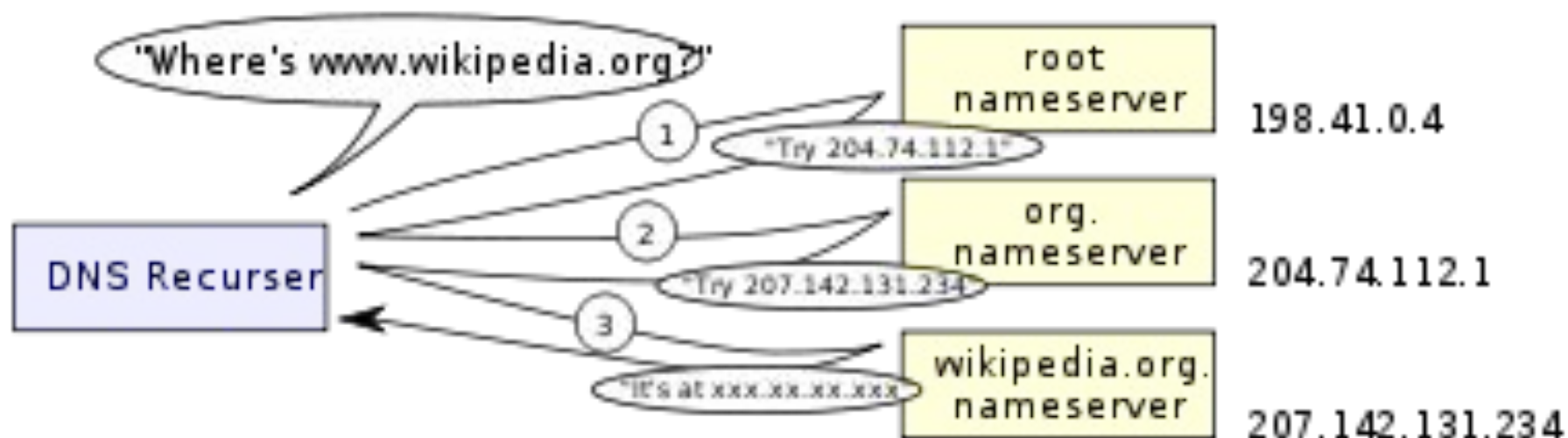
Domain Name Service (DNS)

- Domain names are mapped into IP addresses by the Domain Name System, a network of servers that maintain ***routing tables*** that associate domain names with IP addresses:

DNS Routing Table	
Domain Name	IP Address
trincoll.edu	157.252.10.123
mit.edu	104.109.101.98
css.edu	143.110.1.200

Domain Name Service (DNS)

- The algorithm for looking up an IP address repeatedly requests the IP address from a list of DNS servers until the IP address is found.
- In this example, 3 look-ups are needed before the IP address is resolved.



DNS Simulator

- Now that we understand how the DNS system works, we are going to have some fun doing simulation experiments using the Mobile CSP DNS app.

