CS3530 : COMPUTER NETWORKS ASSIGNMENT - 1

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INTRODUCTION :

Using traceroute, a diagnostic tool that traces the route of internet packets as they go from a source host to a destination host, the aim of this assignment was to gain an understanding of the topology and structure of the Internet. We wanted to visualise the network routes, and analyse the underlying network architecture by executing traceroutes from various source hosts to various destination hosts.

STEPS FOLLOWED :

- Initially we started by finding the IP address/locations traversed by packets from source to destination using traceroute.
- To understand packet route better, we used 5 Host networks i.e., (IITH, Airtel(India), Singapore, Mexico, New York) and 11 Destination websites that is attached as **CN_A1.xlsx** in submission zip.
- Each of the Host Network consist of 11 website data that includes the following for each site:
  - Packet Route (all route IPs the packet traversed from Host to Destination)
  - Autonomous System Number (ASN)
  - Net Range
  - Organization
- For Virtual Hosts Like Mexico and Singapore, we used **LookingGlass website** to get IP Addresses.
- Tool used to fetch ASN is **MyToolBox website**, whose input: IP Address
- Net Range, Organization are fetched using **whois**, whois command gets information about domain names, IP addresses and associated entries.
- After Data Collection, to Visualize the Network Topology we used software named **QGIS** which required the following data:
  - Nodes.csv [IPs as Nodes, lattitude, longitude (IPs accurate Geographic Location)].
  - Edges.csv [from, to (the nodes that are linked)].
  - WorldMap.
- Lattitudes and Longitudes are fetched using API = **ipstack**, with help of IP Address
- for clear distinction, each Destination Website is colored using different colors in the Graph.

FINDINGS AND LEARNINGS :

- By mapping the IP addresses to their geographical locations (using latitude and longitude) we were able to track how data is travelling through intermediate routers to final destinations.
- By looking at the packet routes we were able to identify the ISPs that the data passed through.
- Also through this assignment we able to understood the role of ISPs and other internet providers.
- The assignment also revealed how strong the internet design is , as we can see that there are multiple paths to the same destination , so that breakdown in one path do not lead to complete network breakdown.
- Following are the graphs which shows packet routes:

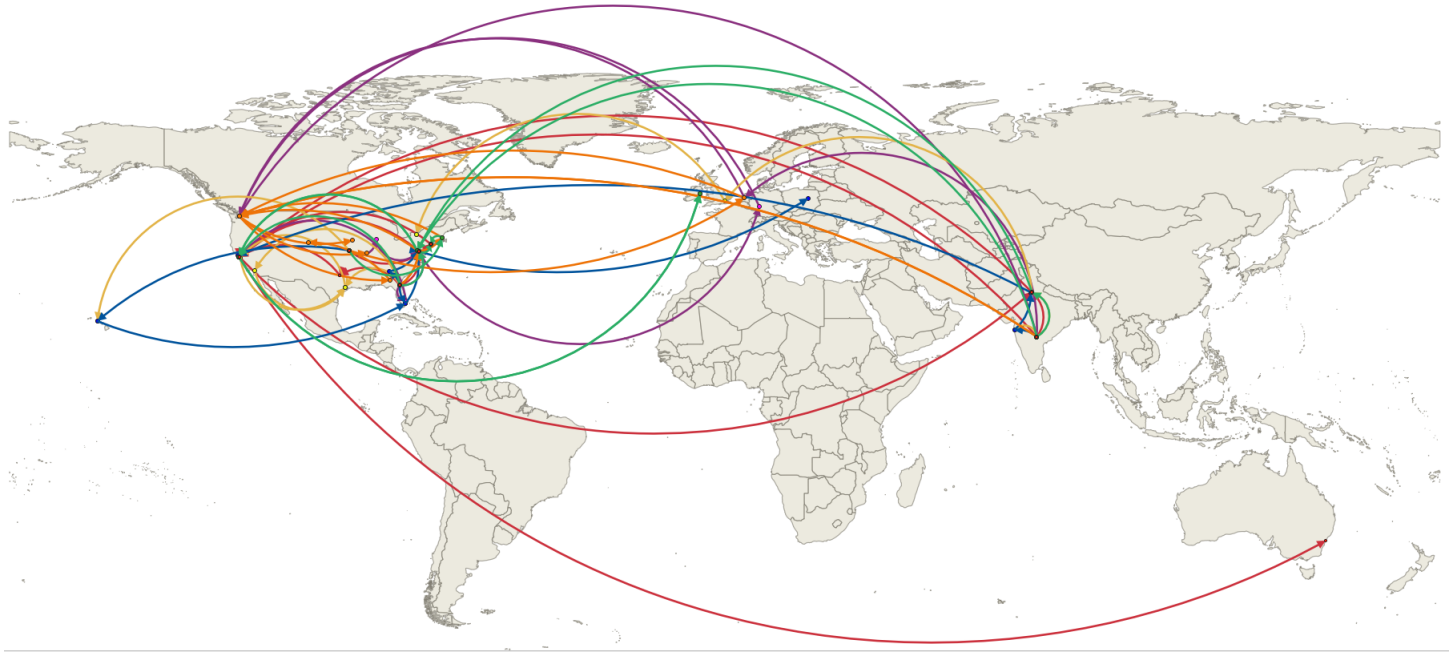

Figure 1: World

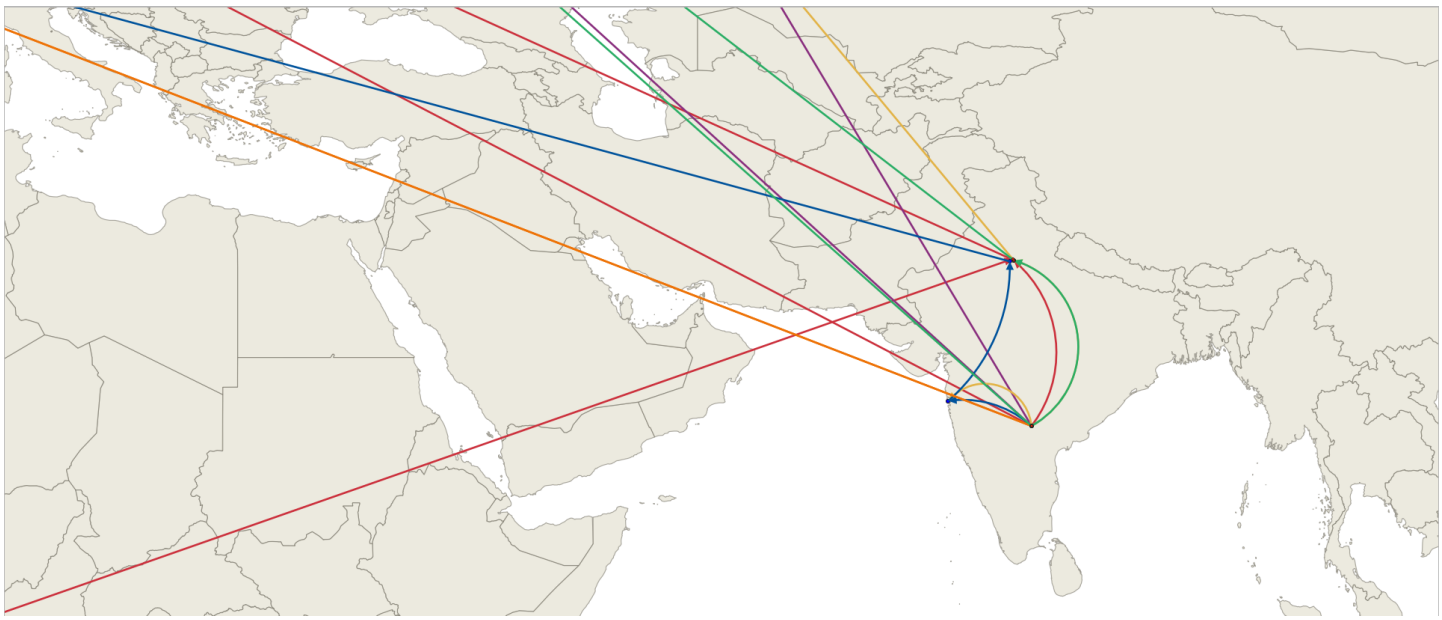

Figure 2: India

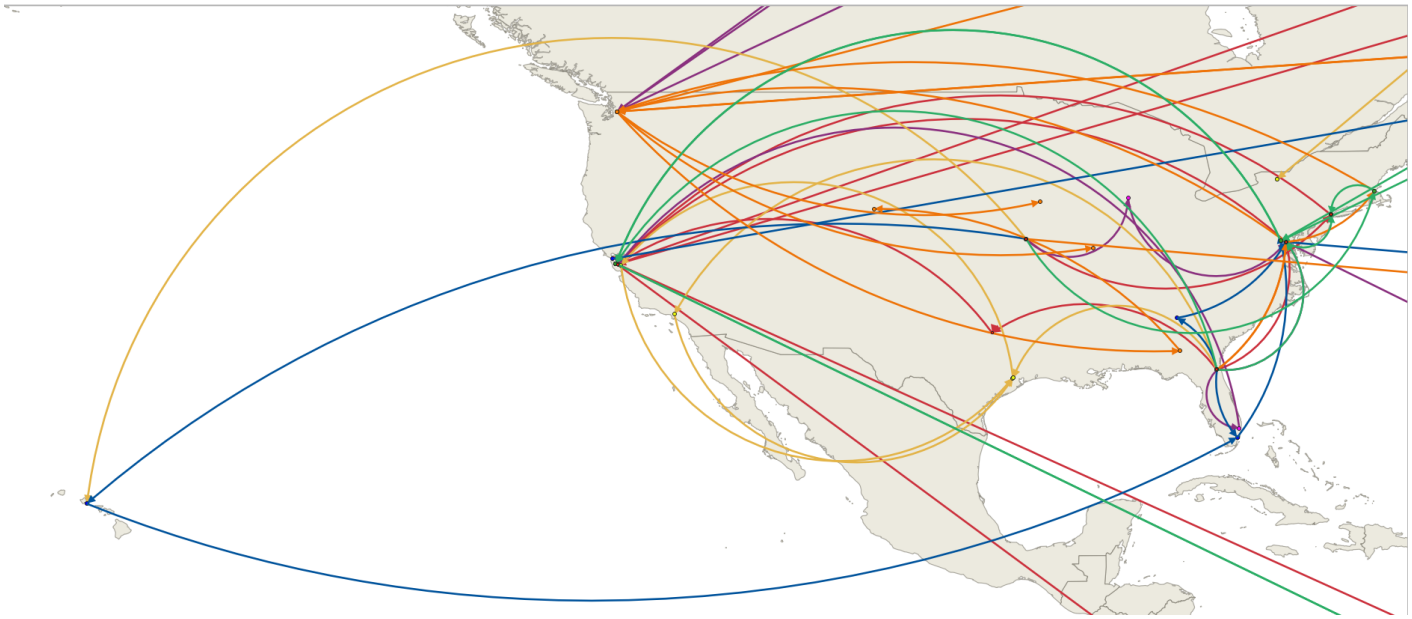

Figure 3: America

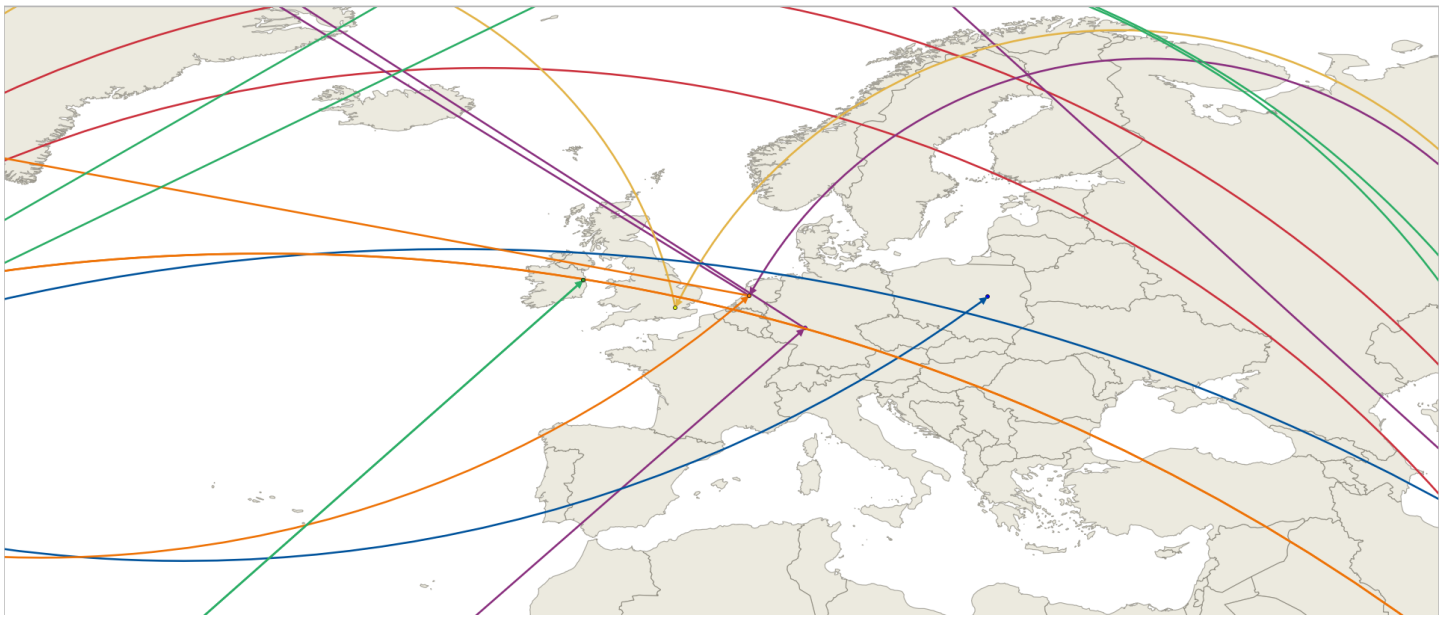

Figure 4: Europe

- In the above figures, the following colors edges and vertices are used to differentiate between different destination sites ,
  - Red - google.com
  - Orange - microsoft.com
  - Yellow - amazon.com
  - Green - instagram.com
  - Pink - openai.com
  - Blue - reddit.com
- From the graphs we could clearly see a topology order in which packets move to destination.

CHALLENGES FACED :

- One challenge we faced was that we couldnt add more destination websites as there were many overlapping networks which made it difficult to visualize the topology

- The geographical locations which were found out for the ip addresses were not always precise , which may have lead to error in the mapping of routers.
- During tracerouting , we have found that some websites were blocked for few host networks which were taken from looking glass.

CONCLUSION :

Through this assignment we have understood the flow of data through several host networks to destinations via many intermediate networks and regions.