Overlay Network

The existing network layer uses default IP routing which defines addressing, routing and service model for communication between hosts. This infrastructure is not good enough because of the following reasons.

1) Routing anomalies like failures, slow convergence, and misconfiguration impact network/service availability.
2) There has always been a trade-off in performance scalability. Internet paths are always sub-optimal.
3) New services need new capabilities like mobility, multicast service etc.

So, the solution could be to change the existing network layer or build an overlay on top of the existing network. Obviously, the second option is feasible.

Description:

So, the overlay network is basically a telecommunication network which runs independently on top of another infrastructure, but supported by it. Virtual overlay network is one form of network virtualization which uses tunneling protocols to form paths between software based network agents in hypervisors running on servers. The virtual overlay network software separates the virtual network from the underlying physical network hardware, enabling provisioning of virtual networks and accompanying services between servers in the data center. Some example are cloud provider networks, peer-to-peer (P2P) networks, virtual private networks (VPNs), content delivery networks (CDNs), experimental networks, and voice over IP (VoIP) services such as Skype. Many of the overlay networks run on top of the public Internet, which itself began as an overlay research network running over the infrastructure of the public switched telephone network (PSTN).

Benefits of Virtual Overlay Network:

The major benefits of using an overlay network are listed as below.

1. The cloud service providers use traffic isolation features to offer secure services to multiple customers. Big industries isolate their specific business units from other production traffics.
2. Overlay networks helps in migrating virtual machines to different locations without worrying about the physical underlying network.
3. It allows to scale the network beyond the virtual local area network limit.
4. It provides independence over the physical network by enabling users to migrate over lower cost data center switches.
5. It also allows users to tie networks to emerging data center standards such as Open stack and cloud stack development environment.

RTT Responses From The Server:

Type of Server	Execution Times	Client1 (RTT in µs)	Client2 (RTT in µs)	Client3 (RTT in µs)	Client4 (RTT in µs)	Client5 (RTT in µs)
Iterative UDP	1st Execution	170114	309743	-646953	528906	30938
	2nd Execution	150123	314096	-649664	574422	69051
	3rd Execution	162669	315148	-635271	539973	40805
	4th Execution	175737	315698	-643173	531196	48461
	5th Execution	158891	315719	-649195	549856	47017
Concurrent TCP	1st Execution	26549	91904	26038	-697329	162051
	2nd Execution	28676	94313	28493	-692075	180558
	3rd Execution	31902	96492	32518	-687528	148217
	4th Execution	34472	98240	35379	-682861	161265
	5th Execution	36771	99598	36602	-678781	165141

Variation of RTT:

In a communication network, the round trip time is the difference of time between a message sent from a client to the server and the response or acknowledgment received by the client from the server.

In the concurrent TCP server, I observed that there is a variation of nearly 2000µs in different executions of a single client. This value is getting increased for every execution. The same pattern is observed while changing the nodes. In iterative UDP, the client gets executed one at a time. So, the RTT increases for every successive clients, but for each execution it sometimes increases and sometimes decreases. In the planet lab overlay network, the nodes are kept in the far away physically. So, we observe a bit more time in the RTT. The iterative UDP server is faster than TCP because there is no acknowledgement involved.