# SATELLITE NETWORK EMULATION

INTRODUCTION

Things are changing in satellite communication services - bandwidth is increasing dramatically and the services are cheaper, though still expensive compared to wired and mobile networks.

Satellites communicate on a number of different wavebands (L, S, C, X, Ku, K, Ka, etc.) with the relatively high frequencies typically used to communicate with geostationary (GEO) satellites and relatively low frequencies used to communicate with low earth orbit (LEO) satellites.

So, in terms of creating a satellite test network (a test network which, from an application perspective, can replicate the real-world satellite environment in the lab), how do these different wavebands effect my applications?

In truth, for most conditions the waveband type doesn't matter to the applications, as they are chosen to effectively support different bandwidth requirements. However, a significant effect is that the shorter the wavelength the more prone it is to atmospheric attenuation, leading to bit errors and therefore data loss. This data loss results in retransmissions and therefore, additional application performance issues.

More obvious performance issues relate to the latency (delay) in the application traffic traversing the satellite network as you can't ignore the laws of physics; the further the distance travelled the greater the latency.

Satellite in Geostationary orbit 35,786 kms above sea level
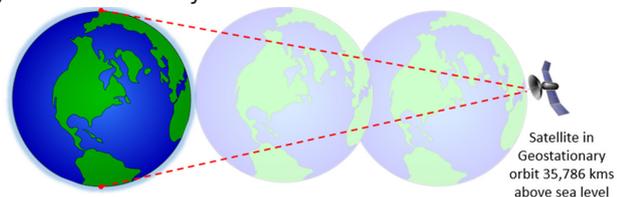
In satellite communications, especially when compared with global wired circuits, the distances can be enormous. Contrast a wired (round trip) latency of 10-20ms between nearby cities to 600-700ms via satellite!
At anything but the GEO orbit level the satellites aren't maintaining their position in one spot over the Earth (maintaining position isn't practicable) so at the lower orbits the satellites are moving, relative to the Earth's surface, sometimes very quickly and this can lead to delay and jitter during satellite handover.

Lastly, to get round the back of the Earth will take more than one satellite hop and that implies even more latency.

APPLICATION TESTING IN SATELLITE NETWORKS

The high commercial cost of satellite network bandwidth and associated resources (e.g. modems) has posed a significant challenge to validating application performance and optimization before release.

Organizations have, therefore, looked for alternative solutions and reluctantly used Satellite Simulators (SatSims). These eliminate the need for dishes and the satellites but not the modems. Therefore, the solution remains relatively expensive and is still cost-prohibitive for many organizations.
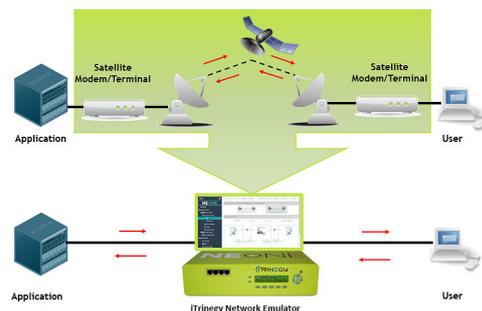
NETWORK EMULATION

Network Emulators provide developers, testers and network specialists with a Virtual Test Network that enables them to test the affects of satellite network conditions in a controlled and repeatable environment. There is no need for satellite modems or terminals to be included in the configuration.

NETWORK EMULATION (CONT.)

Instead a Network Emulator presents standard Ethernet ports which allows the user to easily connect their equipment. When network packets pass through the emulation ports they are impaired to mimic the real-world network.

For example, packets can be subjected to delay (latency/jitter), bit errors, loss, queuing, QoS, etc. to the extent that the impact of environmental factors such as rain fade can be mimicked, so that the effects on application performance can be observed. As a result, developers, testers and network specialists can use the emulator to optimize the application code and verify that any modifications have worked using exactly the same conditions as previously used.

In the real-world there may be multiple network types, in addition to satellite, between the user and the server such as WiFi, LAN, WAN, etc. A Network Emulator can combine different network conditions together, for example WiFi and Satellite, to provide an overall network experience to test with.

NE-ONE EMULATORS

With iTrinegy's NE-ONE Network Emulator, you simply select and run the type of point-to-point or point-to-point multi-point, Dual-Hop Network Scenario you require. You can also dynamically adjust the network conditons using the Network Scenario Builder.

INE ENTERPRISE / ULTRA

Where you need to map multiple network links or large numbers of devices in a more complex network environment, our INE range (INE Enterprise and INE Ultra) with their network drawing interfaces and ability to connect 200+ devices are the ideal choice.

VIRTUAL APPLIANCES

Both the NE-ONE and INE Enterprise are also available as part of our Flex virtual appliances range, certified to run on VMware's ESXi Server.

SUMMARY

Using satellite networks for application delivery provide many benefits but also carry additional risks compared with other types of networks. Organizations that are developing, testing, evaluating or supporting products that run over satellite networks can quickly benefit from using Network Emulation to identify and mitigate the risk of application performance issues or failure. This includes the ability to delay any live satellite network testing until much later in the project lifecycle, leading to significant cost savings.

iTrinegy is an established world leader in Application Risk Management and is trusted by governments, military organizations and enterprises across the globe who have drawn upon our proven expertise in effectively verifying application performance over satellite as well as other types of networks.

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