1.       Standardizing the yardstick.  We are typically focusing on either single links (soft flows) or aggregations of soft flows.  These are characterized as Ethernet in, Ethernet out.  There are many tools for measuring performance, some built in to most operating systems (like a ping command), some are open source tools (like Ostinato), and some are fancy / expensive pieces of test equipment (Ixia).  We cannot afford to have everyone buy high-end racks of equipment, but we need to standardize some methodology and tool set / traffic models, etc across the team.  Please provide advice on the best ways we can do this, as we want to impose these for purposes of comparison/quantification.  They can be a range of things.  Ideally, we could implement these on laptops with CLI and/or GUI interfaces.  They should in the end be “simple-minded”, at least seeming to be simple, like push-button or pull-down in nature  Results should be loggable so that we can prepare analyses and graphs of particular things (like how well a GNAT from one group does against a set of three soft flows on a particular benchmark).

        >>> In a lab environment, we use an emulation testbed to create multiple softflows with controlled properties such as network throughput and delays to test and demonstrate IFT GNAT performance.

        >>> In real world scenarios, emulated softflows will be replaced by SATCOM network connections, LTE connections, optical connections, etc.

        >>> As a standardizing yardstick for GNAT performance evaluation, we use an emulation testbed to generate repeatable softflow conditions and changes of softflow conditions.

        >>> To provide a fair evaluation GNAT performance we propose to define a range of benchmark scenarios. Each benchmark demo/testing scenario is designed to show certain aspects of GNAT functions.

        >>> We envision a series of scenarios that build off one another. First very simple problems that demonstrate very simple solutions working up to more complex problems.

Example benchmark scenarios include:

                                1) Performance under different softflow conditions

                                        1.1 define a number of softflows

                                        1.2 define the throughput of each softflow

                                        1.3 define the delay of each softflow

                                        1.4 test how GNAT behaves under changing of softflow properties (e.g., delay, throughput, etc.)

                                 2) Performance under different traffic, user specifications/applications

                                         2.1 define the number of traffic flows, and types of traffic flows, e.g., FTP, video streaming, uploading downloading

                                         2.2 define the QoS features including throughput requirements, delay requirements, etc.

2.3 test the GNAT overhead on the network

2.4 test the limits of numbers and types of applications supported

Example metrics for testing the performance of the scenarios include:

3) Performance measures for each traffic flow

                                         3.1 achieved throughput measure: total throughput, single traffic flow throughput

                                         3.2 packet delay for each traffic flow compared to QoS requirement

                                         3.3 user perceived network experience for voip, video streaming, etc.

2.       This question is in three parts:

a.       Which soft flows have you been using or plan to use in your work?  In this context, we are talking things like particular SATCOM services, LTE, etc.

        >>> The IFT GNAT router use Ethernet ports as interfaces. It includes one LAN Ethernet port (for connecting a user device, Laptop, etc) and multiple WAN ports (for connection softflows).

        >>> The IFT GNAT can work with any type of softflows (SATCOM networks, LTE network, optical links etc.)

         >>> Softflows we can use include i) LTE network from AT&T and Verizon, 2) Cable network, 3) SATCOM service, 4) emulated softflows with our testbed in a controlled network environment.

b.       Which soft flows can you accommodate?  Can you handle raw Ethernet frames regardless of structure, or do you require IP packets? If IP, do you require UDP,TCP or can you handle both?

        >>> Similar to a commercial of the shelf (COTS) router, IFT GNAT router user Ethernet ports as interfaces to connect to WANs (e.g., 3 WAN ports) and user devices with a LAN Ethernet port.

        >>> IFT GNAT works with IP packets, it can handle both UDP connections and TCP packets.

c.       Are you able to loan soft flows to other team members or make them available?  Again, for very expensive services, I don’t want to repeat these across the entire effort with everyone buying expensive equipment and services.

>>> There are three SATCOM channel bonding services currently on the market, I think all use the same technology.

* + BGAN Converge by Inmarsat
  + BGAN HDR by Inmarsat
  + Skybond by Satcom Direct
* All bond Inmarsat’s L-band channels.
  + BGAN Converge and BGAN HDR bond 2 channels
  + Skybond bond 2 or 4 channels, I think 2 and can aggregate 4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Product** | **Band Used** | **Bandwidth** | **Unit Cost** | **Monthly Cost** | **Notes** |
| **Cobham Explorer 510 BGAN Terminal** | Operates on the Inmarsat L-band satellite network | up to 464 Kbps | $2,425.00 | ~$125 | Next level up if we are interested |
| **Cobham Explorer 710 BGAN Terminal** | Operates on the Inmarsat L-band satellite network | Delivers an expected streaming rate of about 650 kbps | $5,465.00 | ~$125 | Can do bonding |