* A look at the state of mobile satellite Internet

Niels Raijer, Fusix Networks BV

RIPE 71, Bucharest

- Owner & chief architect @ Fusix Networks
- Providing networking services to those companies that need to speak BGP but don't know how
- Vice president @ NLNOG
- Founder @ Coloclue
- Actually M.Sc. Chem.Eng., but 1996 USENET & Linux dragged me into the world of IP

Who Am I

* Make you aware of what some networks do with your beautiful content and why
* Highlight some differences of mobile satellite networks as compared to regular ISPs
* Ask for possible improvements – what else can we do to improve our customer experience (apart from requesting an upgrade to the speed of light)?

* Purpose of this talk
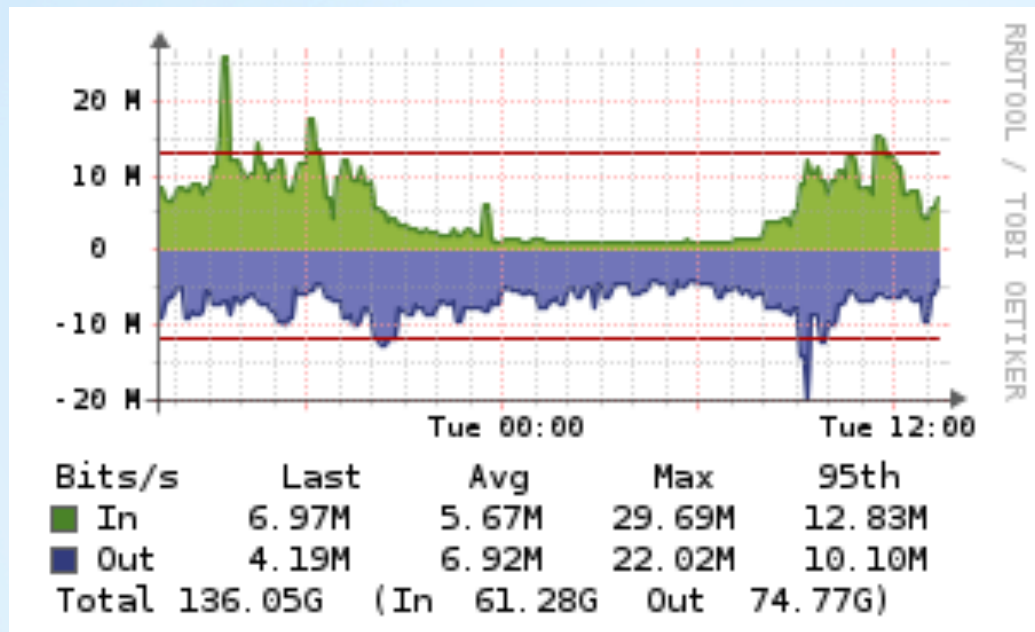
People's mothers
have 40G Internet
at home
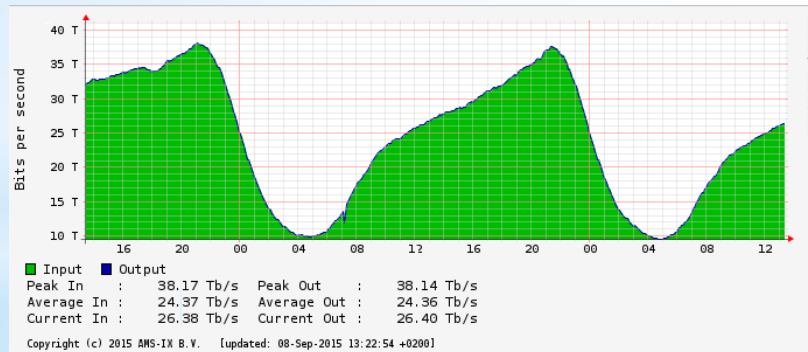
Routers get bigger and bigger

Bandwidth graphs:
the only way is up

*Your world

A look at our AMS-IX port

*My world

```
niels@core1.ams1> ping X.Y.Z.157 count 10
PING X.Y.Z.157 (X.Y.Z.157): 56 data bytes
64 bytes from X.Y.Z.157: icmp_seq=0 ttl=61 time=1644.416 ms
64 bytes from X.Y.Z.157: icmp_seq=1 ttl=61 time=845.648 ms
64 bytes from X.Y.Z.157: icmp_seq=2 ttl=61 time=802.387 ms
64 bytes from X.Y.Z.157: icmp_seq=3 ttl=61 time=1450.196 ms
64 bytes from X.Y.Z.157: icmp_seq=4 ttl=61 time=927.581 ms
64 bytes from X.Y.Z.157: icmp_seq=5 ttl=61 time=935.401 ms
64 bytes from X.Y.Z.157: icmp_seq=6 ttl=61 time=1005.581 ms
64 bytes from X.Y.Z.157: icmp_seq=7 ttl=61 time=971.354 ms
64 bytes from X.Y.Z.157: icmp_seq=8 ttl=61 time=817.182 ms
64 bytes from X.Y.Z.157: icmp_seq=9 ttl=61 time=1003.482 ms

--- X.Y.Z.157 ping statistics ---
10 packets transmitted, 10 packets received, 0% packet loss
round-trip min/avg/max/stddev = 802.387/1040.323/1644.416/266.133 ms
```

*My world

* Mobile satellite != VSAT
* Our customers are typically Inmarsat Distribution Partners
* This service is not very high speed & has a huge latency
* But it works absolutely anywhere (OK, not if you are almost exactly on one of the poles)
* So yes – the service sucks. But if it's all you have…
* Traffic cost: multiple dollars per megabyte transferred

* Mobile satellite

* BGAN = Broadband Global Area Network
* Three flavors: land (=BGAN), maritime (=FBB), aero (=SBB)
* Broadband = up to 492 kbit/s up & down
* 3G network – DPs have an APN with their own RADIUS servers for address assignment, traffic delivered from Inmarsat GGSN via IPSec tunnel
* Uses L-band frequencies (= 1 – 2 GHz)
* IPv6: No. (Outside the lab, that is.)

* Inmarsat BGAN

* The end user equipment (User Terminal or UT) differs in size and shape depending on:
  * Speed required (higher speeds need bigger antennae)
  * Type of service
    * BGAN = book-sized terminal that needs to be aimed at the satellite
    * FBB = dome antenna with auto-aiming plus below decks equipment (BDE)
   * SBB = omnidirectional antenna plus Line Replaceable Unit (LRU)

*BGAN terminals

* Global Express is deployed as we speak
* Speeds up to tens of megabits per second
* Ethernet network with service delivery inside VLANs and routed subnets announced via BGP
* Uses Ka-band frequencies (20 – 30 GHz). Sensitive to rain fade, uses BGAN as backup
* IPv6: Yes. Or. Wait what? (Not even in the lab yet.)

*Inmarsat Global Express
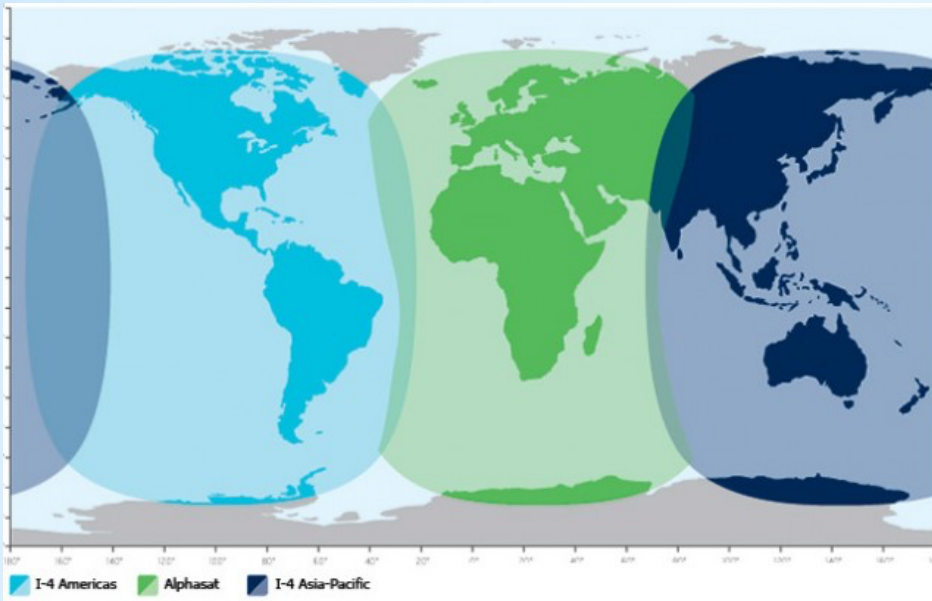
* Both services use geostationary satellites
* Satellites don't seem to move when viewed from the earth
* Explains non-coverage on the poles
* Explains latency (36,000 km above equator)

* Geostationary

*Some of the typical stuff

* Satellite people don't have an IP background
* Even today, services are still being sold that require ISDN dialup out of the LES instead of connecting to the Internet
* Explaining what you need in order to run an IP network is difficult (24/7 NOC, abuse handling, data retention laws etc.)
* Ecosystem developed of companies offering IP-based services as an alternative to satellite provider's own service – not everyone expected that
* Yes – even VOIP

* General satellite pitfalls

* Vessel is usually away for months

* Possibility to install / fix things when in port (which is short)

* Captain's job is to sail the vessel, not to fix his computer

* Telephone calls are difficult and expensive

* Maritime pitfalls

* In the private aircraft segment, the service just always has to work – you cannot predict when the user (presidents, sheiks) will need it
* However, the aircraft is usually easily reachable for installations / fixes
* VVIPs (= aircraft owners) expect to be able to walk on board and have everything just work, including phone calls, software updates, etc.

* Aero pitfalls

* Traffic is expensive, so end users will always try to reduce their bill
* "I did not ask for that traffic" in case a user was pinged from outside
* "No way that my computer sent all that traffic" in case a system is compromised
* The more insight you give, the more the end user will ask for credit notes
* Land-based firewall can block traffic to the customer
* Land-based firewall can block traffic from the customer, but only on the land-based segment

*Unwanted traffic

* Systems on board of a vessel are usually not near "normal" Internet for months

* Software updates are not carried out while crew is at sea

* Identify some infections (e.g. via DNS) but trying to find the actual end user, behind double NAT in many cases, is extremely difficult

```
09:41:58.990810 IP (tos 0x0, ttl 124, id 3950, offset 0, flags [none], proto UDP (17), length 61)
    10.11.71.218.6014 > X.Y.Z.35.53: [udp sum ok] 55654+ A? hzmksreiuojy.nl. (33)
09:41:58.990857 IP (tos 0x0, ttl 64, id 40271, offset 0, flags [none], proto UDP (17), length 77)
    X.Y.Z.35.53 > 10.11.71.218.6014: [bad udp cksum db8e!] 55654 q: A? hzmksreiuojy.nl.
    1/0/0 hzmksreiuojy.nl. [40m9s] A 176.58.104.168 (49)
```

*Infected systems

* In aero, there is usually a firewall on board
* In maritime, traditionally there wasn't (cost reasons) but this is slowly changing
* The on-board firewall usually also contains a proxy / web cache / voucher system for crew welfare
* With an on-board firewall, most of the "Unwanted Traffic Problem" is resolved

* On-board firewall

* Service is absolutely, truly global after implementation of "Global IP"
* Customer /32 moves with the customer using BGP
* "I want a US-based IP address"
* Google shows up in a completely random language

* **Geolocation**

* TCP tweaks possible, TCP Accelerator service recommended to customers (splits the TCP connection in two)
* Commercial products offer further acceleration and compression service
* There are also web-mail like products that offer to view only the "headers"
* And there are proxies that downsample images and block movies in order to save on data usage

*Acceleration & compression

* Some countries require that traffic that originates from / is destined for end users in their territory, lands on an LES in their territory (USA)

* Other countries require that traffic is routed through their country for inspection (Russia, China, Australia) – adds significantly to the latency

* Others just require a copy of the traffic

*Forced routing

*Future developments

* More and more content-based firewalling (primary goal: block Skype)
* Content-based firewalls offering more and more reporting features (so customers can request more and more credit notes)
* More forced routing countries
* In GX, routed subnets allow much better abuse handling
* Higher speeds despite physics
* What further improvements are possible?

* **Developments**

* Mobile satellite Internet service is an "if it's all that you have" proposition
* Mobile satellite ISPs are still getting used to the idea of IP networking
* End users are very hard to support properly and traffic cost makes them wary of any traffic
* All kinds of services are deployed that ruin your beautiful content in order to keep speed up and cost low
* The law has a thing or two to say, too

* Conclusion

*Thank you

niels@fusix.nl