



FR-1000

Application Brief: Anagran's FR-1000 in Mobile Data Networks

Anagran's FR-1000 traffic management system provides substantial gains when deployed in mobile data Networks. The gains include:

Subscriber Equalization – Ensuring that the available capacity of each base station is distributed equally among all the subscribers in each priority class at all times unless there is excess capacity. This is on a short term dynamic basis.

Heavy User Classification: The FR-1000 measures the usage of all subscribers over a selected time longer period and can place those subscribers exceeding a threshold into a "Heavy User" class. This class can be assigned a lower priority and thus reduce their instantaneous rate of usage compared to the average user class. This can therefore reduce them to the same average usage as the normal subscriber.

Support of Premium Service Classes: In addition to ensuring all subscribers get equal capacity, The FR-1000 can observe management information which identifies different paid classes of service. The unique capability of the FR-1000 to control the rate of every flow then allows it to give those who paid more to get higher throughput all the time, by whatever factor is assigned to each service level. Most other premium service techniques only allow more use, not proportionally higher speed usage.

Improved VoIP Performance: VoIP and other highly interactive applications tend to suffer in all mobile IP networks due to excessive delay jitter. Requests to send by mobile IP users can be delayed significantly when the utilization is high leading to stuttering speech and lost syllables. The FR-1000 traffic management controls all the traffic flows in both directions such that the utilization of each base station stays just below a critical point where delay jitter grows excessively. The amazing result is that with no detectable throughput decrease, all VoIP moves to high quality.

Faster Web Access: Another important gain from the same flow rate management needed to improve VoIP is that web access requests are completed up to three times faster. This is because all flows in each web access are maintained at nearly equal rates, avoiding the typical large spread of rates, which allow the slowest flow to determine when the web page is complete.

The FR-1000 Technology

Anagran's founder and CEO, Dr. Lawrence Roberts, also the founder of the Internet in 1969, has pioneered the use of Flow Rate Management to achieve far more effective traffic management capability, features, and economy than the more conventional Deep Packet Inspection (DPI) approach or the built in per subscriber management imbedded in BRAS, CMTS and Mobile systems. Anagran has perfected the ability to control the rate of every IP data flow passing in either direction through the FR-1000 so as to ensure the total traffic rate coming from or going to each remote traffic bottleneck (like a base station or a backhaul channel) stays as close to full utilization as possible without ever exceeding the bottleneck capacity. Due to the major economic benefit of doing this control on a per-flow rather than per-packet basis, the system is far more economic, compact and lower power than DPI or other per-packet systems. Flow rate control also provides the ability to provide per-flow and per-subscriber priorities which result is precise rate differentials where desired, such as for equalizing subscriber usage and providing premium service options.

FR-1000 Specifications

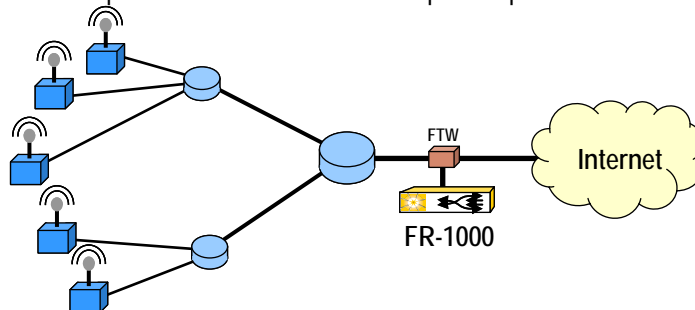
The Anagran FR-1000 is a 1 Rack Unit (RU) modular traffic management system with 4 Slots per unit for Interface Modules (IM's). The following IMs are currently available:

- IM-1GE-BaseTx 12-port 10/100/1000 1G Base-TX
- IM-1GE-SFP 12-port 10/100/1000 Mbps SFP
- IM-10GE-XFP IM 1-port 10Gbps XFP
- It supports up to 48 1 Gbps ports or 4 10 Gbps ports and 40 Gbps of Full Duplex throughput
- It can support 4,000,000 flows, 2,000 VLANs, and 8,000 classes of service
- When managing per-subscriber activity it can support 100,000 subscribers
- Operates either in a bump-in-the-wire mode or utilizing full L3 routing



Installation in Mobile Networks

Typically use in ISP networks has been in the bump-in-the-wire mode using simple external fail-to-wire boxes to insure ease of installation and updates along with non-stop failure operation. Since the FR-1000 does not look inside tunnels at this time and can economically support 10 Gbps channels (or multiple 1 Gbps channels), the preferred place to locate it in a mobile network is at a high concentration point, right where all traffic converts to standard IP traffic ready for the Internet. Besides being in the data path, it also needs to observe the management information to determine the base station each user is using and the priority class of each subscriber, if any. This can be a separate 1 Gbps link if this data is on a separate path.



Deployment of the FR-1000

Although there are many installations of the FR-1000 in Universities and the military in the US, most of the ISP installations have been deployed in Asia where the growth is high, the acceptance rapid, and the P2P overload problem has been extremely severe. Both at the Universities and the ISPs one of the major issues being remedied is that P2P applications use as many as 100 flows at a time, each one appearing minor in traffic use. However, since the Internet was built such that each flow tends to get equal capacity, a subscriber using a P2P app with 100 flows gets vastly more capacity than the average user, creating an extremely unfair situation. Typically 80% of the capacity is then used by 2-5% of the subscribers. The Anagran subscriber equalization however solves this easily without having to continually search deep into every packet to determine the application. That is a losing battle which DPI has conventionally played. Instead, Anagran keeps track of the number of flows and the total traffic per subscriber and then simply adjusts the priority (relative rate) of each subscriber to ensure everyone is getting similar capacity availability. This capability along with the greatly improved response time and total avoidance of congestion provides a compelling and economic solution for both Universities and ISPs.

The P2P problem is not the major problem in mobile networks, but where it exists, this heavy use is solved. The recent discovery of similar heavy user to average user imbalance in mobile networks has more to do with applications which make continuous use of wideband streaming data. Here the same tools that Anagran has successfully deployed in landline applications can also correct the imbalance without the need for usage based tariffs. Everyone likes unlimited service and understands that it slows down when usage is high, even their own.