

SATELLITE AIRTIME PRICING MODELS



This document compares the satellite airtime pricing models with the use of the NRT/NRL from the below satellite providers:

- Globalstar
- Inmarsat BGAN M2M
- Iridium
- Microsatellite

This document is intended as a guide only, it is illustrative only, in US\$, and should not be used to calculate exact costs, as there may be specially priced services for some customers. The data models illustrate the typical airtime costs for two types of application, namely:

- an alert /small data application, e.g. a water level sensor for monitoring tank level, which only transmits the level once or twice per day and therefore requiring a very small amount of data, is well served by message services such as the Iridium or Microsatellite
- a river measurement station or an industrial measurement application with several different instruments measuring routinely, perhaps every 15 minutes needing a larger amount of data is well served by services such as Inmarsat M2M and Globalstar

The data models also assume power is removed from the Inmarsat BGAN M2M for the purpose of modeling, requiring these systems to re-establish a session, with the corresponding session re-establishment overhead each time they communicate. If these systems have power systems dimensioned such that power can remain on, then the session re-establishment overheads will be eliminated.

In broad terms, short burst data services cost in the order of 50 to 100 cents per kilobyte and Inmarsat BGAN services cost in the order of 1 to 3 cents per kilobyte.

INDICATIVE MONTHLY DATA VOLUME

SCENARIOS FOR FULL SERVICE DATA

For the purposes of generating indicative payload sizes and data volumes, the following scenarios are used.

These values account for logger RTD and but no other comms overheads.

1. **Very Low Data Volume – Once a Day:** 3 data channels once per day = 222 bytes per day or **7KB** per month
2. **Low Data Volume – Once an Hour:** 3 data channels every hour = 222 bytes per hour or **164KB** per month
3. **High Data Volume – Once every 5 Minutes:** 6 data channels every 5 minutes = 2,736 bytes per hour or **2MB** per month
4. **Medium Resolution Serial Camera pictures - Once an Hour** = 25k per hour or **20MB** per month
5. **High Resolution IP Camera pictures - Once an Hour** = 110k per hour or **88MB** per month

SCENARIOS FOR MESSAGE SERVICES

For the purposes of generating indicative payload sizes and data volumes, the following scenarios are used.

6. **Very Low Data Volume – Once a Day:** 3 data channels once per day = 12 bytes per day or **372 bytes** per month
7. **Low Data Volume – Once an Hour:** 3 data channels every hour = 12 bytes per hour or **8,928 bytes** per month
8. **High Data Volume – Once every 5 Minutes:** 3 data channels every 5 minutes = 72 bytes per hour or **107,136 bytes** per month

COMMUNICATIONS OVERHEAD ASSUMPTIONS

The Neon Remote Terminal and Neon Server Protocol incur packet overheads of 76 bytes per packet.

For Log Data packets, overheads can be proportionately large. E.g. 76 bytes of Header and 6 bytes of Log Data payload equals 82 bytes total.

Each time a Neon Remote Terminal communicates with the server it also sends 64 bytes of RTD with a 76 byte header for a total of 140 bytes.

So, if 3 data channels are being logged, it is not just 6 bytes of data that is sent but rather two packets of total size (82+140) = 222 bytes.

Serial Camera payloads incur overheads of roughly 9.6%

IP Camera overheads incur slightly smaller overheads of roughly 3.7%

An 894 byte packet can contain a maximum 818 bytes of payload.

There will be additional data overheads for establishing the PPP comms session plus acknowledgements etc between the server and the logger.

Note that when using message services like Iridium and Microsatellite the full Neon server protocol is not implemented because these networks have high latency and cost making it impractical, this means that there will be no protocol overheads when these services are used and it will be just encoded logged data that is transmitted.

CAMERA PAYLOAD SIZES

STILL VIDEO IMAGES

The Neon Camera System can be configured to take several different sized resolution pictures. For the purpose of this document we are using only two generalised resolutions.

- Medium resolution: Serial Camera pictures (640x480) are 25K each.
- High resolution: IP Camera pictures (1,280x800) are 110k each.

VIDEO

- Medium resolution: IP Camera video (800x600x2fps) is 1MB per minute.

GLOBALSTAR MODEL

Data Charged in Time Increments, not Bytes. Data Charged in 10 second Blocks.

Corporate and Government rate plans provided by Pivotel service provider as an example

Globalstar Plan = Data30	Very Low Data Volume	Low Data Volume	High Data Volume	Medium Res Photo	High Res Photo
Monthly Base Price	\$30.00	\$30.00	\$30.00	\$30.00	\$30.00
Comms Frequency	1 Daily	1 hour	5 minutes	1 hour	1 hour
Bytes per Comms	224	224	230	25,000	110,000
Bytes per second	818	818	818	818	818
Packets per Comms inc. 2 OH	2	2	2	33	136
10 Seconds per Comms	1	1	1	4	14
Comms per Month	31	732	8,784	732	732
First 10 Second Packets Per Month	31	732	8,784	732	732
Next 10 Second Packets Per Month	0	0	0	2,196	9,516
Cents per First 10 Second Packets	4	4	4	4	4
Cents per Next 10 Second Packets	16.67	16.67	16.67	16.67	16.67
Monthly Packet Price	\$1.24	\$29.28	\$351.36	\$395.35	\$1,615.60
Minus Monthly Included Calls	-\$10.00	-\$10.00	-\$10.00	-\$10.00	-\$10.00
Monthly Total Price	\$30.00	\$30.00	\$371.36	\$415.35	\$1,635.60

INMARSAT BGAN M2M SERVICE MODEL PLAN BASED - LOWER VOLUME USAGE

Hughes 9502 Sat. Modem Cycled Every Session. Data Charged in Bytes, not by Time

Comms Session = 28 byte protocol overhead data per packet. 28 byte log data.

Billing increments for Standard IP is rounded up to next 1 kilobyte every session.

BGAN M2M 12 Month Plan, Per SIM Card	Very Low Data Volume	Low Data Volume	High Data Volume	Medium Res Photo	High Res Photo
Comms Frequency	Daily	1 hour	10 minutes	1 hour	1 hour
Payload Bytes per Comms	222	222	240*1	25,000	110,000
Billing Bytes per Month	30,500	732,000	4,392,000	31,671,976	136,867,892
Monthly Subscription Cost	\$36.70	\$36.70	\$53.90	\$136.70	\$136.70
Monthly Allowance	2MB	2MB	5MB	20MB	20MB
\$/MB Out of Bundle	\$23.35	\$23.35	\$13.30	\$6.80	6.85
Monthly Total Price	\$37	\$37	\$54	\$216	\$937

INMARSAT BGAN M2M SERVICE MODEL PLAN BASED - HIGHER VOLUME USAGE

Hughes 9502 Sat. Modem Cycled *Once Per Day*

Data Charged in Bytes, not by Time

Comms Session = 28 byte protocol overhead data per packet. 28 byte log data.

Billing increments for Standard IP is rounded up to next 1 kilobyte once per day.

BGAN M2M 12 Month Plan, Per SIM Card	Low Data Volume	High Data Volume	High Data Volume	5 Minute Data + Medium Res Photo	5 Minute Data + Medium Res Photo
Comms Frequency	Daily	5 minutes	1 minute	1 per Day	3 per Day
Payload Bytes per Comms	240	240	240	25,000	25,000
Billing Bytes per Month	1,055,080	2,109,160	10,541,800	2,969,604	5,977,657
Monthly Subscription Cost	\$36.50	\$36.50	\$95.00	\$53.90	\$53.90
Monthly Allowance	2MB	2MB	10MB	5MB	5MB
\$/MB Out of Bundle	\$23.25	\$23.25	\$9.50	\$13.30	\$13.30
Monthly Total Price	\$37	\$39	\$100	\$54	\$67

INMARSAT BGAN M2M SERVICE MODEL

Hughes 9502 Sat. *Modem Cycled Every Session* (High SIMS - High Data Pool Based)

Data Charged in Bytes, not by Time.

Assume Fixed \$10.00 per SIM Monthly fee and \$10 per MB (some providers may offer this for large numbers of SIM cards)

BGAN M2M 12 Month Plan, Per SIM Card	Very Low Data Volume	Low Data Volume	High Data Volume	Medium Res Photo	High Res Photo
Comms Frequency	Daily	1 hour	10 minutes	1 hour	1 hour
Payload Bytes per Comms	222	222	240*1	25,000	110,000
Billing Bytes per Month	30,500	732,000	4,392,000	31,671,976	136,867,892
Monthly Subscription Cost	\$10	\$10	\$10	\$10	\$10
Monthly Allowance	0MB	0MB	0MB	0MB	0MB
\$/MB Out of Bundle	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
Monthly Total Price	\$10	\$17	\$54	\$327	\$1,379

INMARSAT BGAN M2M SERVICE MODEL

Hughes 9502 Sat. *Modem Cycled Once Per Day* (High SIMS - High Data Pool Based)

Data Charged in Bytes, not by Time.

Assume Fixed \$10.00 per SIM Monthly fee and \$10 per MB (some providers may offer this for large numbers of SIM cards)

BGAN M2M 12 Month Plan, Per SIM Card	Low Data Volume	High Data Volume	High Data Volume	5 Minute Data + Medium Res Photo	5 Minute Data + Medium Res Photo
Comms Frequency	10 minutes	5 minutes	1 minute	1 per Day	3 per Day
Payload Bytes per Comms	240	240	240	25,000	25,000
Billing Bytes per Month	1,055,080	2,109,160	10,541,800	2,969,604	5,977,657
Monthly Subscription Cost	\$10	\$10	\$10	\$10	\$10
Monthly Allowance	0MB	0MB	0MB	0MB	0MB
\$/MB Out of Bundle	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
Monthly Total Price	\$21	\$31	\$115	\$40	\$70

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IRIDIUM MODELS

Pricing per 10 Byte Block and using the Corporate and Government rate plans provided by Pivotal service provider

Data Charged in Bytes, not by Time. Data is charged in 10 byte block increments, below example shows if the data fits within the 10 byte block (8 bytes)

Iridium per 10 Byte Block, SBD Rate Plans	Very Low Data Volume	Low Data Volume	High Data Volume
Comms Frequency	Daily	1 hour	5 minutes
Payload Bytes per Comms	8	8	8
Data Bytes per Month	248	5,952	71,424
Monthly 10 Byte Blocks	248	744	8,928
Monthly Subscription Cost	\$16.50	\$27.50	\$66.00
Monthly Allowance (Bytes/Block)	3,000/300	8,000/800	30,000/3,000
Bytes Out of Bundle	0	0	41,424
\$/10 bytes Out of Bundle	\$0.110	\$0.066	\$0.033
Monthly \$ Out of Bundle	\$0	\$0	\$196
Monthly Total Price	\$17	\$28	\$262

Pricing per 10 Byte Block and using the Corporate and Government rate plans provided by Pivotal service provider

Data Charged in Bytes, not by Time. Data is charged in 10 byte block increments, below example shows if the data is over the 10 byte block (12 bytes)

Iridium per 10 Byte Block, SBD Rate Plans	Very Low Data Volume	Low Data Volume	High Data Volume
Comms Frequency	Daily	1 hour	5 minutes
Payload Bytes per Comms	12	12	12
Data Bytes per Month	372	8,928	107,136
Monthly 10 Byte Blocks	62	1,488	17,856
Monthly Subscription Cost	\$16.50	\$49.50	\$66.00
Monthly Allowance (Bytes/Block)	3,000/300	17,000/1,700	30,000/3,000
Bytes Out of Bundle	0	0	77,136
\$/10 bytes Out of Bundle	\$0.110	\$0.033	\$0.033
Monthly \$ Out of Bundle	\$0	\$0	\$490
Monthly Total Price	\$17	\$50	\$556

MICROSATELLITE MODEL

Pricing per Number of Transmissions (Max 144 bytes). Transmission blocks of messages must be purchased before connection is provided/ prepaid model.

Typical cost of a block of messages is \$1000. Latency of the service can be several hours, hence the High Data Volume Illustration while included for financial comparison, is technically impractical. Data Charged for number Messages / not by time.

Microsatellite per 10 Byte Block, SBD Rate Plans	Very Low Data Volume
Comms Frequency	Daily
Payload Bytes per Comms	12
Transmissions per Month	31
Monthly Subscription Cost	\$1
Monthly Allowance Transmissions	31
Out of Bundle	0
Monthly Total Price	\$1

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