Schedule I: SES Broadband Specification

1. GLOBALTT & SES BROADBAND

SES provides the technical facilities required for a bi-directional satellite internet service through its SES Broadband platform. The SES Broadband NOC connects the End-Users to the Internet using forward- and return channels via satellite. SES Broadband allows broadband internet access in forward- and return path using DVB-S2 signals uplinked from Betzdorf, Luxembourg.

Downstream IP traffic will be transmitted via the satellite to the End-User's PC with the data rate limitation as specified under **Paragraph 3.1**. Upstream IP traffic will be transmitted via satellite from the End-User's PC to the SES Broadband platform with the data rate limitation as specified under **Paragraph 3.1**.

The overall SES Broadband offering can be split into the following units:

- Provision and operation of the SES Broadband Satellite Internet access service platform.
- Provision and operation of uplink/downlink services
- Provision of satellite capacity in the Ka-band frequency band on the SES satellite system at the **28.2 degrees East** orbital position.
- Provision of Internet backbone connectivity according to the provided satellite bandwidth and the agreed QoS scheme.

In order to enhance the efficiency and effectiveness of SES Broadband, SES has the right to enable the following platform features:

- Compression technologies for all kinds of Content,
- Performance enhancing proxy (RFC 3135),
- IP transport layer encryption (both ways),
- Pre-fetching at the proxy server,

The SES Broadband platform includes a comprehensive Network Management System allowing:

- Network monitoring,
- Service Package configuration for the End-User,
- Modem provisioning,
- Remote Modem Configuration,
- Remote Modem Monitoring,
- Access to traffic accounting information,
- Access to traffic congestion information,
- Possibility of logging End-User traffic to comply with regulatory requirements.

If any third party applications or services are not compatible with SES Broadband services, then SES and the Customer shall use all reasonable efforts to solve and adapt such incompatibility.

1.1. The Consumer Premises Equipment (CPE)

The CPE required to connect the End-User's PC to the SES Broadband platform consists of:

- a satellite antenna (typical size in France is 76cm equivalent electrical aperture diameter) equipped with a receive/transmit radio front-end (typical EIRP for transmission: 48 dBW)
- a satellite modem equipped with DVB-S2 demodulator and return link modulator. This satellite modem provides a standard Ethernet interface and is acting as an IP bridge. The satellite modem is controlled by the SES Broadband Network Management System.

SES recommends that the CPE shall be installed by a professional installer trained by the Customer on SES Broadband CPE installation. The typical dish size required in Belgium shall be subject to change with prior notice to the service provider in case of necessary changes to the transmission parameters or to the technical service specifications.

The minimum End-User equipment needed for SES Broadband consists of a PC connected to the satellite modem via an Ethernet interface.

PC, Voice over IP (VoIP) accessories (see also **Paragraph 2**) and standard network accessories (like routers) connected to the satellite modem via the Ethernet interface are in the Customer's or End-User's sole area of responsibility and are thus not covered by the present Agreement. These components are not controlled by SES Broadband platform.

1.2. Net Data Rates in Up- and Downstream Path

The net data rate per End-User (in up- and downstream path) depends on the actual usage of the SES Broadband service, i.e. on the cumulated bandwidth consumption of all simultaneous active End-Users. In case the system is heavily loaded, the net data rate per End-User can be decreased to values lower than the data rate limitation per End-User in up- and downstream path as specified under **Paragraph 3.1**.

The quality of SES Broadband also depends on the traffic load on terrestrial backbones and on interface limitations of Internet servers.

No minimum data rate (in up- and downstream path) guarantee can be provided by SES.

1.3. Internet Backbone Connection

SES provides the Internet Backbone connectivity according to the provided satellite bandwidth and the agreed QoS scheme (see **Paragraph 3**).

SES Broadband has no influence on the data rate in connected terrestrial networks and Internet servers. Therefore – concerning SES Broadband - SES does not guarantee any minimum QoS, as the data rate provided via satellite also depends on the QoS offered by the terrestrial backbone and/or the overall internet.

1.4. End-User Registration

The End-User Registration can occur manually or automatically.

To perform manual registration, the Customer shall use a GUI (called DASHBOARD) to register each End-User under the corresponding SLA.

To perform automatic registration, the registration shall be managed by the Customer's platform. Before registration, the SES platform can provide a minimum connectivity allowing the End-User to reach the Customer's platform (Pre-Registration). After successful registration, the Customer's platform will request that the SES Broadband platform activates the corresponding Service Package for the new End-User. De-activation of an End-User account will also be explicitly requested to the SES Broadband platform.

The data exchange interface (for automatic registration) between Customer's and SES' platforms is based SOAP. A detailed description of the available commands will be made available by SES. End-User traffic information can be collected by the Customer from SES via HTTP csv file.

1.5. Licenses to use radio spectrum & authorisations to operate the satellite network

The Customer acknowledges and agrees that the provision of space segment services shall be subject to all applicable laws, regulations, requirements and conditions.

The Customer acknowledges and agrees that from time to time, SES may be required to temporarily suspend space segment services to verify compliance of one or more End-User sites with applicable licenses, authorizations, and compliance with the technical and operating parameters of the satellite. Under such circumstances, SES will use reasonable efforts to minimize disruption to the space segment services and will provide as much advance notice as is reasonably practicable under such circumstances. The Customer shall fully cooperate with SES in such circumstances and will provide End-User site access to any competent government authority, SES and its subcontractors.

In connection with each installation at each End-User site the Customer shall designate one individual that is authorized to make decisions relating to the installation of the CPE at each End-User site to conform to the ERC decision (e.g. no installation within 500m of an airport's fence).

2. VOICE OVER IP (VoIP) SERVICES

VoIP is supported by the platform with the adequate QoS management: priority is given to the voice traffic over any other types of traffic. This QoS management ensures that any call accepted by the platform ("Call Admission Control") is only affected by acceptable delay and delay jitter.

The VoIP traffic is routed from the SES' hub to the Customer's VoIP platform.

The provision of VoIP services via satellite via the SES Broadband platform as stated in this Agreement is subject to the condition that a low bit rate codec is used (as specified in **Paragraph 3.2**).

The VoIP termination is in the Customer's sole area of responsibility. At the End-User's site, this VoIP termination should be implemented as a consumer VoIP router with analogue voice interface or connected to IP phones.

Important: SES and the Customer shall validate together each allowed configuration before service deployment.

The number of "voice paths" treated with high priority by the system is limited by the SES Broadband platform (as specified in **Paragraph 3.2**). The Customer's VoIP platform shall control the admission of voice calls taking this maximum into account: if the maximum number of voice calls is exceeded, a busy signal shall be sent to the End-User VoIP equipment.

No capacity is permanently blocked for voice: all free capacity is used for Internet traffic. The free capacity is distributed to all users if the number of voice calls is lower than the maximum.

The interconnection, transit and termination fee to third party networks is not part of this Agreement (it remains in the Customer's sole area of responsibility).

3. TECHNICAL SPECIFICATIONS

3.1. GlobalTT & SES Broadband Package Specifications

Platform and Signal Uplink Location: SES Broadband NOC (Network Operations Centre)
SES Broadband Services S.A.
Château de Betzdorf
L-6815 Betzdorf

Service Mode: Permanent Stream (24h/day, all days per year)

Service Packages:

Ka-band Service Packages	Technical Service Specifications				
	Speed Limitation		Volume included per month	Quality of Service*	
	Max speed downstream (KBit/s) (up to)	*Max speed upstream (KBit/s)* (up to)	*Cumulated GBytes* (up- & downstream)	*KBits/reg. end user* (downstream) (up to)	*KBits/reg. end user* (upstream) (up to)
Volume limited Packages					
20480/2048 5 GB	***20480***	**2048**	**5 GB**	**15.0**	**2.5**
20480/2048 15 GB	***20480***	**2048**	**15 GB**	**20.0**	**3.3**
20480/2048 20 GB	***20480***	**2048**	**20 GB**	**28.0**	**4.7**
20480/2048 25 GB	***20480***	**2048**	**25 GB**	**34.0**	**5.7**
20480/2048 50 GB	***20480***	**2048**	**50 GB**	**42.0**	**7.0**
Unlimited Packages					
20480/2048 Unlimited	***20480***	**2048**	**Unlimited with FUP** *(FUP = Fair use Policy)*	**25.0**	**4.2**

Explanations:

Speed Limitation: See above table, column “Speed Limitation”: Maximum data rate in up- and downstream per single end user; maximum (best-effort) overall data rate provided to one single end user and all his/here initiated parallel download sessions. The speed limitation is per end user (i.e. per registered Service Package) and includes all active sessions opened by the end user. The speed may vary to lower data rates depending on network congestion and Fair Use Policy (see **Paragraph 4** of this Schedule I, “Fair Use Policy”). SES is allowed to decrease the maximum data rate per end user (see **Paragraph 4** of this Schedule I “Fair Use Policy”).

Volume included per month: See above table, column “Volume included per month”:Total cumulated volume/month (in GByte) for up- and downstream path per

	single registered Service Package; maximum overall volume/month provided to one single End-User; for "Unlimited Packages" the monthly volume is unlimited but restricted by the Fair Use Policy (see **Paragraph 4** of this Schedule I); for "Volume limited Packages" the cumulated (up- and downstream) monthly volume is limited as given in the above table (for the specific volume limitations in up- and downstream please refer to paragraph 4 "Fair Use Policy") ; the implemented volume limitation is per End-User (i.e. per registered Service Package) and includes all active sessions opened by the End-User. For the avoidance of doubt, VoIP traffic is not included in this volume/month.
Quality of Service:	See above table, column "Quality of Service": Maximum satellite bandwidth (in KBit/s) per registered SES Broadband Service Package; no committed information rate (CIR) per single end user/Service Package; the above given values may be adjusted by SES.

Platform Backbone Connectivity:	SES provides internet backbone connectivity in accordance to the provided satellite bandwidth and the registered Service Packages.
Modulation Format:	Downstream: DVB-S2 Upstream: SATMODE physical layer
Transmission Technology:	Downstream: DVB Multi-Protocol Encapsulation ETSI 301 192 Upstream: DVB-RCS based
System Availability:	as defined in **Clause 5.1** of the Main Agreement

3.2. Service Specification Voice over IP

Number of voice circuits allocated:	30 per 1000 End-Users Use of CAC (call admission control) is recommended to avoid exceeding calls
Allowed Voice Codec:	G723.1 or G729
PTime settings for G729:	20ms (recommended) and 50ms
PTime settings for G723.1:	30ms

The platform binds a SIP domain (IPv4 or FQDN) to the ISP account. All VoIP calls placed using this SIP domain will be treated with specific VoIP QoS.
VoIP calls not using this SIP domain will go best effort and compete with other Internet traffic. The SIP domain is detected in the To and From fields of the SIP INVITE message.

IMPORTANT:	It is the responsibility of the Customer to ensure that all parameters are correctly configured. **GlobalTT &** SES cannot guarantee the VOIP service in the case these parameters are not correctly implemented. **GlobalTT &** SES and the Customer shall validate together each allowed configuration before service deployment.

The data volumes generated for VoIP are not accounted for the Fair Use Policy limitation per month.

To the extend that the number of allocated circuits per 1000 Users is not exceeding 30 circuits, the QoS of the VoIP option remains valid whatever the Fair Use Policy of the End-Users. (in up- and downstream path).

The SES Service Package offering shall be provided to the Customer as of the Operational Start Day of the ASTRA 2F satellite to be located at 28.2 East Orbital Location with a dedicated Ka-band transponder payload. SES will notify the Customer about the successful Operational Start Day of ASTRA 2F in writing. The Operational Start Date as defined hereunder shall be deemed not to have occurred when SES notifies the Customer in writing about a launch failure of ASTRA 2F, launch failure meaning a total or a constructive total loss of ASTRA 2F or a partial launch failure or satellite malfunctioning as long as if affects the performance of the Ka-band transponder payload. The Customer acknowledges and agrees that it shall not be entitled to seek specific performance to compel SES to cause any satellite (whether in orbit or not), to be constructed or launched or made commercially operational at any orbital location. Except as otherwise expressly set forth in this Agreement, SES does not assume any liability or obligation in the event that the Operational Start Day does not occur due to launch delay or launch failure.

3.3. Service Specification “FreeZone”

The option “FreeZone” can be selected for some SES Broadband Service Packages (see Schedule III). If this option is selected for a Service Package all traffic generated within the respective Service Package during 12.00 h midnight and 6.00 h am (all days per week) is not counted, i.e. for volume limited Service Packages the monthly volume will only be counted outside this “FreeZone” period. For unlimited Service Packages the monthly volume of the respective Fair Use Policy table will only be counted outside this “FreeZone” period.

3.4. Service Specification “FUP Reset”

The option “FUP Reset” can be selected for some SES Broadband (unlimited) Service Packages (see Schedule III): If this option is selected for an unlimited Service Package the Fair Use Policy table for the respective Service Package is reset in the respective month.

Please note, that the monthly traffic period doesn't follow the calendar month. The start of a traffic-month of each registered terminal is calculated on its unique ID using a mathematical function. This allows SES to spread the traffic resets of all terminals equally within a calendar month.

3.5. Service Specification “additional GB”

With this option “additional GB” the end user can – in case he consumed his monthly volume - buy additional GB for his volume limited Service Package. When his monthly volume is exceeded the end user is automatically re-routed to a specific website of the Customer, where he can buy the additional GB. The development and set-up of this end user website access lies in the responsibility of the Customer.

3.6. End user Interface

Communication Protocol:	TCP/IP
Physical Interface:	Ethernet 10/100baseT (auto-detect)

4. SES BROADBAND FAIR USE POLICY

The SES Broadband Fair Use Policy system is a network tool – managed by SES - to monitor and control SES Broadband network resources with the intention of giving all end users fair access to SES Broadband network resources. It uses specific algorithms to identify disproportionate use (= very

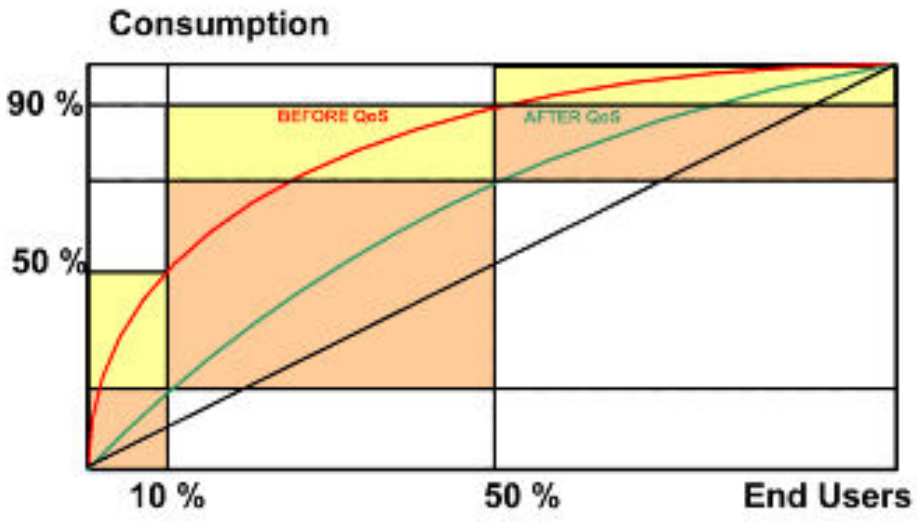
high volume consumption) of network resources. Such disproportionate use is restricted by the Fair Use Policy, and higher priority is assigned to end users with lower volume consumption.

Notably, the SES Broadband Fair Use Policy does NOT limit the total downstream and upstream volume per end user.

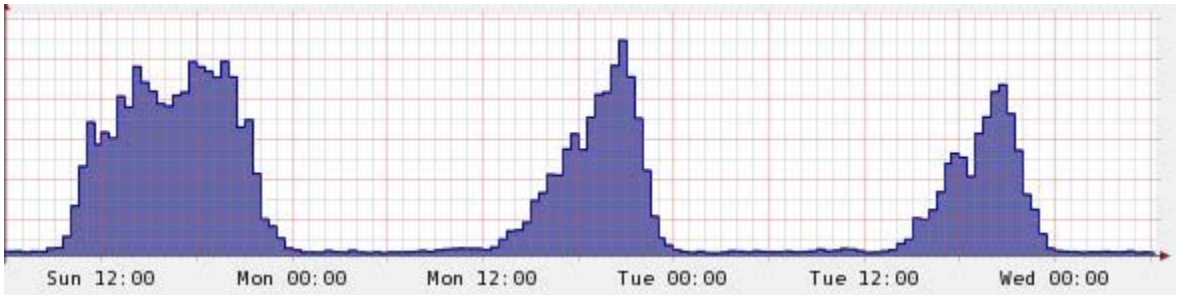
As with all broadband services, the available SES Broadband network capacity, which connects end users to the internet, is a shared medium. Therefore, in order to maintain the best possible Quality of Service, it is necessary that a Fair Use Policy is maintained especially during peak usage hours. Peak usage hours in a broadband network are typically defined by a high congestion of network resources.

The SES Broadband Fair Use Policy ensures that - during these peak hours - the service cannot be used disproportionately by only a few "heavy" end users:

- Within the Fair Use Policy the maximum downstream data rate per end user is decreased from a maximum value down to a minimum value in accordance to the end user's individual monthly downstream volume consumption (see tables hereafter). The maximum upstream data rate per end user follows a similar principle (but with an independent process). The maximum speed limitations for up- and downstream – as given in **Paragraph 3.1.** (Service Specifications) - can be set by SES per single end user.
- In case of non-peak time usage (i.e. typically during the night and morning hours) higher data rates may be provided per connected end user than stated in the following Fair use Policy tables (see "Congestion Factor (CF) (examples) and related speed" in the following tables where the CF < 1). However these data rates will not exceed the maximum data rate of the respective Service Package (i.e. maximum data rate in Step A of the respective Service Package).
- In case of peak time usage (i.e. typically during late afternoon until late evening), connected end users may experience lower data rates than stated in the following Fair Use Policy tables (see "Congestion Factor (CF) (examples) and related speed" in the following tables where CF > 1). This is caused by network congestion during this period of the day.
- The consumed volume (MB) per end user in up- and downstream will be re-set every 4 weeks, i.e. the maximum data rate given in Step A (see tables hereafter) is applicable after every (monthly) volume re-set.



The above chart illustrates why a Fair Use Policy is needed in order to deliver a consistent Quality of Service to all SES Broadband end users all of the time: it shows that around 10% of end users (the red line) are heavy users, who - without a Fair Use Policy in place - would consume 50% of all system resources, heavily affecting the quality of service for all other end users. The Fair Use Policy (the green line) reshapes the consumption profile towards a linear distribution (the black line) ensuring that more end users have access to system resources.



The chart above gives an indicative illustration how the usage can vary by time of day and by day of the week. In this example the peak usage occurs mainly between 5 pm to 10 pm during week days and between10 am to 10 pm during weekends (i.e. high congestion). The Fair Use Policy ensures that system resources are available to all end users in a fair and equitable manner during these periods.

SES has the right to adapt (decrease) the maximum data rate (speed limitations) for specific end users, who use the SES Broadband too extensively and who would otherwise reduce the overall service performance for all connected end users. This adaptation is gradual and is based on volume thresholds/limitations given in this paragraph. This adaptation is required in order to improve and optimize the overall service performance for the majority of the registered end users.

Furthermore SES will manage the overall up- and downstream traffic also in relation to its nature and may therefore reduce the bandwidth for certain kind of traffic (e.g. so called peer-to-peer applications) during peak time in order to prevent an overall congestion of SES Broadband.

4.1. Fair Use Policy for Service Packages with unlimited volume

The following tables show the Fair Use Policy for these Service Packages (see also **Paragraph 3.1**).

Fair Use Policy – 20,480/2,048 Unlimited												
Downstream										**Upstream**		
	Consumed Volume/ month (MB)		**Data rate limitation (Mbps)**	**Congestion Factor (examples) and related downstream speed (Mbps)**						**Consumed Volume/ month (MB)**		**Data rate limitation (Mbps)**
			(at CF=1)	**0.1**	**0.5**	**1**	**2**	**4**				*(at CF=1)*
Step A	<	4,200	20	20	20	20	10	5		<	800	2
Step B	<	8,400	5	20	10	5	2.5	1.25		<	1,600	0.512
Step C	<	12,500	2	20	4	2	1	0.5		<	2,500	0.256
Step D	<	16,700	0.512	5	1	0.512	0.256	0.128		<	3,300	0.128
Step E	>	16,700	0.256	2.56	0.512	0.256	0.128	0.064		>	3,300	0.064

The above shown Congestion Factor (CF) is a measure for the load of the network service and varies heavily during the day. During the day the CF typically reaches values of about 2 – 4, sometimes – for a short period of time – even up to 6 or higher. During the night and early morning hours the CF typically reaches values of about 0.1 – 0.5. To a great extent the CF is driven by the network usage pattern of all registered end users. The CF also applies to the upstream data rate.

4.2. Fair Use Policy for Service Packages with volume limitation

The following tables show the Fair Use Policy these Service Packages (see also **Paragraph 3.1**).

Service Package 20480/2048 5GB VOLUME limited			
Forward path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 4.267	20480	1
B	>= 4.267	RESTRICTED / REDIRECTED	
Return path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 853	2048	1
B	>=853	64kbit/s	

Service Package 20480/2048 15GB VOLUME limited			
Forward path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 12.800	20480	1
B	>= 12.800	RESTRICTED / REDIRECTED	
Return path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 2.560	2048	1
B	>=2.560	64kbit/s	

Service Package 20480/2048 20GB VOLUME limited			
Forward path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 17.067	20480	1
B	>= 17.067	RESTRICTED / REDIRECTED	
Return path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 3.413	2048	1
B	>=3.413	64kbit/s	

Service Package 20480/2048 25GB VOLUME limited			
Forward path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 21.333	20480	1
B	>= 21.333	RESTRICTED / REDIRECTED	
Return path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 4.267	2048	1
B	>=4.267	64kbit/s	

Service Package 20480/2048 50GB VOLUME limited			
Forward path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 42.667	20480	1
B	>= 42.667	RESTRICTED / REDIRECTED	
Return path			
STEP	Consumed volume/month (Mbyte)	Data rate limitation (kbit/s)	VIP
A	< 8.533	2048	1
B	>=8.533	64kbit/s	

The above shown Congestion Factor (CF) is a measure for the load of the network service and varies heavily during the day. During the day the CF typically reaches values of about 2 – 4, sometimes – for a short period of time – even up to 6 or higher. During the night and early morning hours the CF typically reaches values of about 0.1 – 0.5. To a great extent the CF is driven by the network usage pattern of all registered end users. The CF also applies to the upstream data rate.

5. CHANGES OF TECHNICAL SERVICE SPECIFICATIONS

Any change of the technical Service Specifications shall be mutually agreed by the parties, except in cases where an immediate change is necessary, in which case SES shall give the Customer as much advance notice of such change as practicable under the circumstances. Such changes shall be made in order to keep or increase the quality of SES Broadband.

The **GlobalTT** satellite specific and generic sales and usage conditions are applicable.