EBU

OPERATING EUROVISION AND EURORADIO

TECH 3361-1

SERVICE LEVEL AGREEMENT FOR MEDIA TRANSPORT SERVICES

HIGH LEVEL GUIDELINES

Geneva
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Contents

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Service Level Agreement for Media Transport Services

High Level Guidelines

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1. Introduction

With the rapid growth of IT infrastructure, reduced provisioning cost and turnaround time, more and more Broadcast Media Organisations (BMOs) are considering the use of data network services as a media transport method. However, when it comes to preparing Service Level Agreements (SLAs) between BMOs and Network Service Providers (NSPs), many organisations find themselves lacking knowledge in this field, especially on how to specify and negotiate the specific requirements of Media Organisations.

This document, prepared by the EBU Service Level Agreement (SLA) Project Group, is intended to give readers a realistic high level view of the components and principles that require careful consideration when a SLA for media transport services is negotiated.

The target audience for this document is professionals from BMOs, who will lead or contribute to SLA negotiations or have the responsibility to sign off Service Contracts. This document also intends to help NSPs to understand the specific requirements of broadcast media transport over their network services and how to integrate them into a more conventional telecom SLA framework.

Another goal of this document is to ease the communications between the parties (i.e., different departments involved in the BMO and the NSP) by providing a common vocabulary, as wording and concepts may vary between fields with different backgrounds, such as broadcast engineers, IT specialists and telecom operators.

Although other organisations such as ITIL or the ITU-T have already published documents that provide frameworks and guidelines to SLA preparation, there is a strong demand from BMOs for guidance on how their specific broadcast media needs may be translated into models that are in use in the IT and Telecom industries. See §8. “References” for a list of frameworks this group has reviewed.

1.1 How to use this document?

This document provides a Definition of Service Level Agreement, sets the Scope of Media Transport and explains the key differences from a pure telecom or IT SLA. The Functional Specifications of a service are then addressed, followed by the Service Level Objectives and the Operational Specifications. Finally, the question of Penalties and Incentives is also addressed.

This document is for information purposes and intended to be used as a guideline companion. It is not necessary to include all the elements outlined within this document in every SLA. It is nevertheless suggested as a checklist to make sure all important SLA aspects that are relevant to any specific case are covered, whether in the SLA document itself or in a related Service Contract.

Because the actual SLA text depends highly on its context, such as the type of service provided, the natures of NSP and BMO, national legislation, etc., it would be hard to recommend a specific model that can support all the cases. Therefore, this document doesn't use conformance keywords ("shall", "should", "may") in a normative way.

A companion Glossary of Terms is the object of EBU Tech 3361-2. Definitions of technical parameters are covered in EBU Tech 3361-3.

2. Definitions and Scope

2.1 What is a Service Level Agreement?

Formally, a Service Level Agreement forms part of a Service Contract that is negotiated between the customer and the service provider for a certain service. For detailed information on Service Contracts, please see Annex 1: Contractual Framework.

A Service Level Agreement defines in quantitative terms the target levels of quality that a service must meet. It also defines how these targets shall be monitored and what procedures shall be instigated to mitigate problems when a service is disrupted. Other operational aspects, such as delivery conditions and the penalties to be applied in case of failure also form part of a SLA.

SLA in practice

A good SLA should aim at translating the business needs of the customers into a set of Service Level Objectives made of measureable parameters that can be agreed with the service provider at an acceptable cost.

In practice, there are numerous ways of writing Service Contracts and Service Level Agreements and their respective content may vary considerably from one model to another. Since this document's aim is to address the specificities of media transport services, the term "Service Level Agreement" is used loosely to include both service description and functional specifications that are part of the Service Contract rather than a SLA in certain frameworks.

2.2 What is Media Transport and what is covered in this document?

First, what is Media? Media types considered in this document are professional video and audio, and intercoms to be used in the course of professional media production. Media data rates can range from high quality uncompressed HD video (1.5 Gbit/s to 3.0 Gbit/s per stream), mezzanine compressed video (e.g. JPEG 2000 at 150 Mbit/s) to low bit rates for presence monitoring or for intercom use (e.g., 64 kbit/s audio).

Transport applications considered in this document are primarily real-time services for live contribution such as inter-studio, inter-campus and broadcaster-to-broadcaster links, Outside Broadcast Van or SNG contributions. Primary distribution such as from playout centres to distribution partners can also rely on the same model. However, delivery to end users at home is not covered.

The SLA principles outlined in this document can also be applied to media file transfer applications, where transfer speed can be faster or slower than real time. File transfer activities can be specified with a minimum guaranteed data rate, for high priority or as low priority to be put in queue for whenever spare capacity is available.

In addition to data transport services (physical, data link and network layers), BMOs may require NSPs to supply specific audio and video interfaces using underlying network technologies as a whole service package.

Guidelines outlined in this document target private networks where levels of service can be controlled by NSPs. Public networks are out of scope of this document as it is very difficult to specify a SLA for uncontrollable infrastructures. Services referred to in this document are those

requiring negotiation between two parties. They do not include rate-card types of service, such as a standard ADSL service provided by telecom operators, where it is not possible to negotiate a specific SLA.

Finally, in this document, we assume end-to-end services with the same technology interface at either end.

2.3 Types of services

There are different types of services that NSPs may approach differently when dealing with their associated SLAs, such as:

- **Permanent Service**: this normally is a long-term contract that is very similar to other telecom services. It will have regular invoicing, typically per month. It is sometimes called a "leased line", "private circuit" or "data line". An example might be a permanent link between two studios in two locations where TV interviews are held frequently. Or it can be a permanent 10 Gbit/s Ethernet optical service from the playout to the uplink with ASI services for distribution needs.
- **Permanent Service, with Occasional Use (P/OU)**: this type of service is invoiced for the usage. It may include a booking system with guaranteed response time and the resources are guaranteed to be available when requested. An example might be a permanent service provided by NSP to a BMO but this service is shared by different departments of this BMO for their occasional use. Another example is FINE, a fibre based infrastructure provided by Eurovision where an EBU Member broadcaster can book when they need their remote correspondent to contribute back to base. This broadcaster will be invoiced according to its use. Usage covers low key sport event as well as news.
- **Shared Infrastructure, with Occasional Use (S/OU)**: this is a 'first come first served' system so the resources may not be available upon request. The level of service and target availability may be variable depending on the usage of the infrastructure. This type of service may include a booking system with guaranteed response time. It is invoiced for the usage. An example might be when an NSP has a link to a football ground which can be booked by any BMO for occasional use. It is also often encountered for contribution over satellite where a time slot on the space segment can be booked.
- **Temporary Service**: for special events coverage that can be for a few days up to a few months duration. The measurement period of technical parameters needs to be shorter than for permanent services. In this case, a standard availability metric is usually not sufficient to fulfil business requirements and additional measures must be put in place to guarantee service continuity for critical applications. An example might be a 10G Ethernet service that is provisioned to provide live TV, audio and IP Services from a temporary based infrastructure (i.e. an OB) from a national or international special event such as the Olympics.

2.4 What requirements do broadcasters have that make Media Transport SLAs different?

This section is a summary of the requirements that are important to BMOs that a NSP may not need to consider when providing conventional data transport services to other types of customer. Many of these elements will be developed further throughout this document.

High Performance

Real time large volume traffic quality is critical to BMOs, and as a consequence Service Level Objectives are more stringent compared to other types of telecom service. For instance, for professional audio, service requirements are similar to that of VoIP but with higher performance parameters (e.g., higher sustained bandwidth, lower and more constant latency, etc.). Another example, for real-time broadcast applications, jitter and packet reordering need to be kept very low to minimise the consequent buffering time that causes end-to-end transmission delay. Since

the resending of packets is not possible, packet losses must be minimised and compensated by other recovery mechanisms such as Forward Error Correction (FEC).

High Availability

For their critical services, BMOs need highly reliable systems based on high availability services. The Target Service Availability figure of the SLA needs to be used carefully and must often be complemented by additional measures to ensure the required level. See §4.2 "Service Availability".

Extra testing and monitoring

In the set up of such a service, clearly defined tests must be carried to verify performance and stability over time and under worst case traffic scenarios. Monitoring and measurement during transmission is also essential to quickly identify a deterioration of performance, so as to prevent an eventual failure. That is why a proactive provider's Network Operating Centre (NOC) is very important to BMOs. Reaction procedures and protection mechanisms must be specified precisely in addition to target availability. Fast repair time is needed in case of failure and it must be specified in SLAs too.

Mission Critical Times

Since the value of the transported content often fluctuates with time, it can be useful to specify periods that are mission critical. This can help to get the required quality when it is most important while keeping the cost down by modulating the resources and taking extra precautions only when it is of most importance. Change freeze can also be specified to avoid taking extra risks around Critical Times.

Contract Termination Option

It may be relevant to include the conditions under which the BMO can terminate a long-term contract. This would be the case if, for example, the BMO loses the rights to a football series and therefore will no longer need the fibre infrastructure to the stadium. The conditions and amortisation of the investments have to be specified in advance.

SLA is just one of the tools

It has to be stressed that it is much more important for BMOs to get the required services than being refunded in case of failure. In this context, an SLA is a valuable communication tool to state clearly the expected quality of the service and how this shall be achieved. BMOs must be aware that an SLA cannot alone give them the desired business continuity. Good system design, sufficient and trained operational staff and best practice are all vital to achieve success.

3. Functional Specifications

This section outlines the main functional characteristics of data transport and media services often used by BMOs.

3.1 Service Description

The Service description should provide enough information so that the requirements of the target application can be fulfilled with the service offered.

Transport Protocol and Interface

Both the transport protocol and the interface that is presented to the BMO need to be detailed. It can be for instance SDH, IP, MPLS, Ethernet, SDI[1] , MADI, etc.

Using a layered approach based on the Open Systems Interconnection (OSI) model, the services can be mapped as shown in the table below. The layer of the service provided and all layers below are

[1] In this document, SDI refers indifferently to SD-SDI, HD-SDI or 3G-SDI.

under the responsibility of the NSP. All layers above are the responsibilities of the BMO. The quality of the service shall be measured using parameters relevant to the layer at which the service is provided.

In addition, we can divide the services in 2 categories:

- **Data Transport Services**: These are the physical, data link and network layers – layers 1 to 3 of the OSI model. When a BMO purchases this category of service, it is the BMO's responsibility to provision the correct media interfaces to fulfil the media application. In this case the BMO needs to specify the level of service it requires from the transport service to support the target media application.
- **Media Services**: Should NSPs be contracted to provide this category of service, they will be responsible for media output quality, regardless of the underline transport technology.

	LAYER	APPLICATIONS	SERVICE	EXAMPLE
	Media Services	Video or Audio services (over IP, Ethernet, SDH)	SDI IN to SDI OUT AES IN to AES OUT	SDI in Brussels and SDI out in Geneva (Example 1, on figure "Examples of SAPs")
Data Transport Services	Network (Layer 3)	IP MPLS based IP-VPN, Data access via UMTS / LTE, IP link over Satellite	IP-VPN, MPLS-VPN (provider managed CPE)	Encoder output as IP feeds into CPE in Brussels, and CPE IP output feeds in decoder in Geneva (Example 2)
	Data Link (Layer 2)	Ethernet private line (pseudo wire), Ethernet private LAN service (VPLS), Ethernet over SDH (EoSDH), Radio link	Native Ethernet, Ethernet over MPLS, SDH, etc.	Encoder in Brussels and decoder in Geneva, transport video over Ethernet (Example 3)
	Physical (Layer 1)	Dark fibre, λ fibre, Copper	xWDM, patch field, fibre cable	SDI to 1490 λ in Brussels and receive it in Geneva (Example 4)

Supported Protocols Requirements

This is a list of the protocols that may be required by media applications and their associated underline services. These may include but are not limited to: IGMP, RTP, NTP, PTP, etc.

Static parameters

Static parameters are set once and don't need to change during normal operation of the service. Examples include link speed, packet size, QoS level or Class of service, etc.

3.2 Service Access Point

The Service Access Point (SAP) is a demarcation point where an NSP hands the service over to its customer. It defines the border of responsibility for the installation, maintenance of wiring and equipment. It is also the point where measurement of service quality is carried out. It must therefore be clearly and carefully defined in any SLA.

A SAP can be an equipment interface. In practice, it is often a patch panel that links Customer Premises Equipment (CPE) and BMO equipment. For security purposes, the CPE can be confined to a specific room that can only be accessed by the NSP personal (or its subcontractor) for the purposes of installation and maintenance. In this case the BMO's equipment is installed in a separated room and no NSP has physical access to this part of the building. The interconnection between the "provider room" and the "broadcaster room" are dedicated cables installed and operated by an agreed party.

It is also a good practice to state who is providing the infrastructure such as air conditioning, power and the access management for the "provider room".

With a SAP clearly defined, broadcast requirements at each SAP need to be stated in terms that service providers understand and can fully accept. This may be eased by describing the service

using the layer model, as explained earlier.

Figure 1 illustrates examples of possible Service Access Points for services provided to a media organisation, together with their corresponding layer.

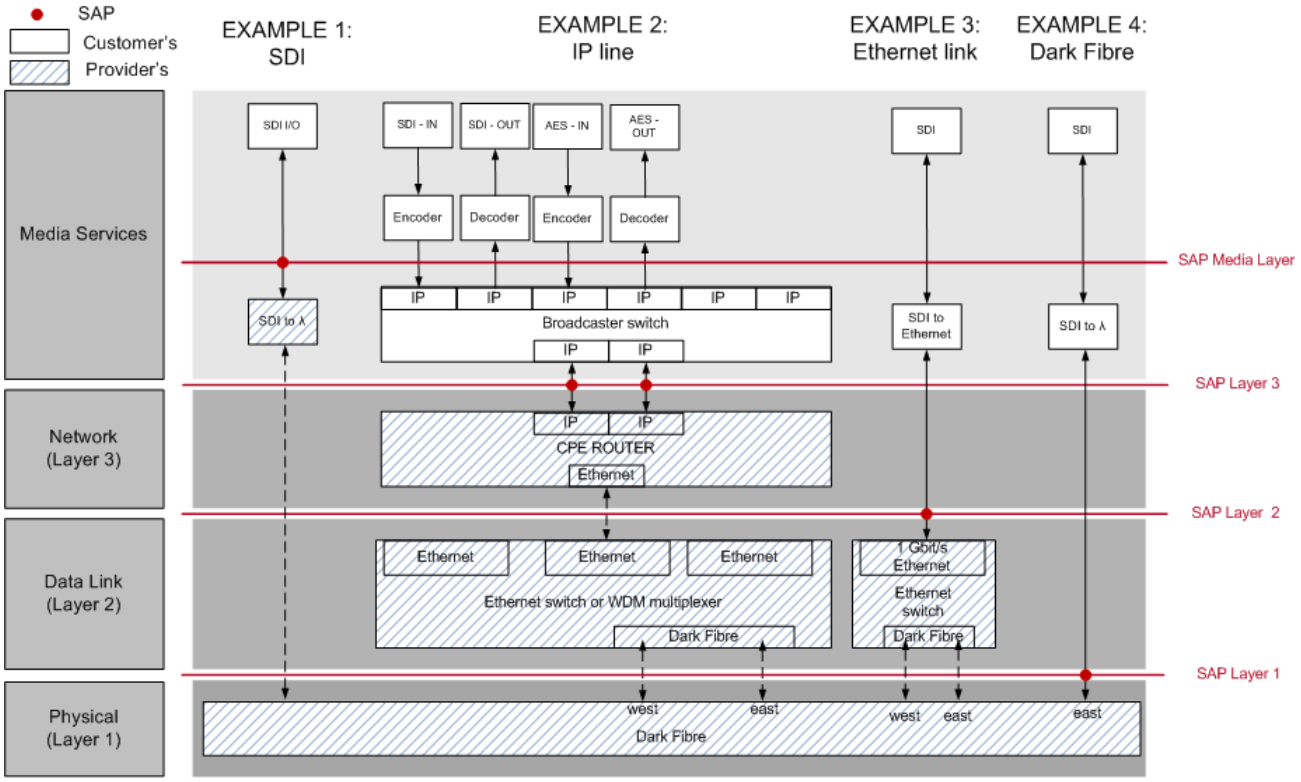

Figure 1: Examples of SAPs

3.3 Protection and resilience

Provided protection

A service, in order to reach a required level of target reliability, may include protection and resilience mechanisms, redundant paths and equipment and/or diverse entrance points with manual or automatic failover. If protection provision is part of an SLA, it means the protection mechanism is under the NSP's responsibility and is positioned at the NSP side of the SAP. For this case, the service description should include a description of the protection mechanisms.

Examples of protection and resilience mechanisms and strategies include redundant (active or passive) links, carrier diversity (same or different technologies, such as fibre and satellite), entrance diversity and redundant equipment (with specified minimum distance between the sets of equipment), no single point of failure design, FEC, traffic engineering and defined prioritisation, etc. For more details on types of protection, see EBU Tech 3361-3 Technical Parameters document.

Service vs. System

In order to get a higher level of reliability to fulfil the requirements of a demanding application, the BMO may provision separate redundant services of the same or different layers to handle any likely failure. For example, the BMO may want to provision satellite and fibre links from different NSPs to cover the same event. In this case, a SLA must be specified for each of the services supplied. The switch-over point would then be located on the client side of the SAP and the providers would only be responsible to deliver their service at the level specified in their respective SLA. The overall System reliability level must be managed by the client BMO.

Note that it may be difficult to verify if two services from different NSPs are truly diverse (carrier diversity), for example both may use the same underlying fibre rented from a 3rd party supplier.

4. Service Level Objectives

4.1 Service Level Objectives definition

In order to define a good SLA, the Service Provider and Media Organisation need to agree on a set of Service Level Objectives (SLOs).

SLOs are generally specified in terms of a target value (or range) and a measurement description outlining the measurement period, when, where and how the measurements be carried out. A SLO may be composed of one or more parameter measurements that are combined to produce the SLO achievement value.

A good Service Level Objective must be clear, measurable, and achievable for both parties. A minimal set of SLOs should be carefully selected to achieve the most important business requirements. It is also essential that the measurements taken by both sides should be visible to the other side and be reviewed regularly to ensure that there is a level playing field.

Typical Service Level Objectives that define **service performance** are:

- **Availability**: Service Availability is a very common parameter to provide an indication of the service level offered. More explanation is given in §4.2 "Service Availability".
  - **Maximum Time to Restore (MTTR)**: The time period between the discovery and reporting of a Fault and its resolution.
  - **Maximum non-resilient Time**: A maximum time that a redundant link can be lost from service.
- **Traffic performance**: A set of measurable technical parameters shall be selected and assigned with defined thresholds in order to evaluate service behaviour, speed and reliability of the data/media transmission. There are a number of possible parameters that are dependent on the type of service purchased and on the quality required. More information will be found in the upcoming technical parameters document.

Service Level Objectives that define the **level of operational support** can be:

- **Time to report issues**: This specifies the delay of reporting the issues depending on their level of priority. See §5.5 "Fault Management".
- **Online Booking Availability**: When using an online booking system, the system should be available at all times, i.e. in a fully functional state. The availability is measured as a percentage of a suitable period, e.g. monthly.
- **Manual Booking Availability and Response Time**: When using a manual booking service via a NOC, the booking centre should be available all year round, with a specified maximum response time to a call, e.g. 5 minutes.
- **Booking Minimum Notice**: The minimum time gap between booking time and the service activation should be defined in the SLA, e.g. 1 hour or less.

Other measureable parameters that define the required quality of the service can be specified as a Service Level Objective.

In case of failure in achieving the SLOs, a procedure is usually triggered (See §5.5 "Fault Management") that may result in penalties (see §6. "Penalties and Incentives").

4.2 Service Availability

Service Availability or just Availability is a key element of any conventional Service Level Agreement. It is usually a way for the NSP to quantify the service level provided. However for media transport services, an Availability target may be insufficient to describe the required level of reliability, see "Service Availability for Broadcast Media", below.

The Availability definition may vary between different SLA models and it is therefore important that a clear definition and method of measurement be understood and agreed.

Availability Target

The Availability target of an SLA indicates the probabilistic level of reliability of the service provided, based on its design, including protection mechanisms that are included in the service.

In general, NSPs define this number based on the past statistics of the network service (or a similar design) over a long period of time (e.g. 1 year):

$$A_{target} = \frac{MTBF}{(MTTR + MTBF)} \times 100\%$$

Where

A_{target}: Availability Target

MTBF: Mean Time Between Failure

MTTR: Mean Time To Restore

It practically states the total percentage of time when a service may be unavailable in a given period before a specified penalty can be applied. See §6."Penalties and Incentives".

An alternative way to present the Target Availability is by the number of nines, e.g., 99.99% being "four nines" availability.

Examples of typical Availability figures in Western Europe (Availability for 12 months):

99.85% can be met with a single E1 service (2.048 Mbit/s circuit) with no resilient "last mile";

99.9% can be provided by a single Ethernet tail;

99.99% requires dual services and at least 1 is "up" at any time

99.999%+ needs more "infrastructure" resilience – e.g. DC power systems and battery backup.

Achieved Availability

It must be clear to both parties what 'Service Availability' means; i.e. how is unavailable time counted and what time period is being used for the calculation. A general formula to evaluate the effective Availability from monitoring of the delivered service is:

$$A_{Achieved} = \frac{Mp - \sum UA}{Mp} \times 100\%$$

Where:

Mp: Measurement time period. For permanent services, typical measurement time period is either a month or a year depending on the agreement and the type of service. For temporary services, this can be a shorter period such as a month or what is actually related to the duration of the contract.

UAT: Unavailability times = the time intervals where the service was deemed unavailable.

Technical parameters used to evaluate whether the service is unavailable during a fixed time interval are technology dependant and are addressed in EBU Tech 3361-3 Technical Parameters document.

It is important that the selected parameters used for Availability calculation must be measurable by both the provider as well as the consumer.

Not Unavailable times

A list of exclusions is usually included to cover cases that are outside the measurement period when evaluating the achieved Availability:

- Planned work that is agreed with the customer (see §5.3 "Planned Work, Change Freeze and Unplanned Work").
- Failure of equipment, cabling, services or network that is on the customer side of the SAP.
- Failure to provide NSP access to customer premises.
- Failure of NSP equipment in the consumer premises caused by the interference from customer.

When a protected service is provided it will be considered unavailable only when all the diverse paths between the end-points of the service are all unavailable at the same time.

Service Availability for Broadcast Media

It must be pointed out that because Target Availability deals with statistical averages over a long period of time, it is often not sufficient or accurate to define the reliability of the service required by the BMO for Critical Times or Occasional Uses.

In practice, for live broadcast media, BMOs often require Target Availability of 99.99% to 99.999% for their most valuable content. But even for these expensive network solutions, the unavailability allowed is still too high for the most Critical Times. In fact, the business would require more "nines" (practically 100% Availability) during Critical Times such as prime-time high audience events. Less "nines" are required during periods such as standby, installation, rehearsal, pre-show, etc. As a worst case example, 10 seconds of programme loss during an Olympics 100 m sprint final or during the winning goal of a football World Cup would not in itself breach the Target Availability SLO, as shown in the table below.

Total unavailability time corresponding to Target Availabilities

Measure		Annually	Monthly
Availability	**Unavailability**	**(h:mm)**	**(h:mm)**
99.999%	0.001%	0:05	(24 sec)
99.990%	0.010%	0:52	0:04
99.950%	0.050%	4:22	0:21
99.900%	0.100%	8:45	0:43
99.500%	0.500%	43:48	3:36

For these reasons, Target Availability most often needs to be complemented by additional and more detailed measures, such as functional specifications (e.g., protection and resilience), Service Level Objectives and operational specifications.

5. Operational Specifications

5.1 Delivery conditions and acceptance testing

This is a delivery procedure which includes obligations from both customers and providers in order to ensure timely and safe installations. User acceptance testing before formal delivery of the service may include load tests and stability tests.

5.2 Booking System

Depending on the requirements for Occasional Use or short term Temporary Service, it may be relevant to include requirements for a booking system in an SLA. A booking system of such services can either be done through an on-line self-service system, e.g. a website connected to a service

providers' provisioning database, or via a Network Operations Centre (NOC) managed booking system. An SLA may include an identification method and service booking instructions with different options provided to the user and a confirmation procedure. Finally, it should be made clear which party is responsible for verifying the accuracy of the booking.

5.3 Planned Work, Change Freeze and Unplanned Work

It is important to make an agreement between the NSP and BMO on how, when and for how long to organise planned work such as firmware upgrades, equipment maintenance, etc. These windows are generally during non-peak hours and non Critical Times so as to cause minimal disruption to customers. These periods are not taken into account for Achieved Availability calculations.

Due to the nature of the media business, riskier operations such as firmware updates and equipment replacement should be avoided at Critical Times, such as just before or during the Olympics coverage, the Christmas and New Year period. This needs to be clearly defined.

A minimum notice for irregular unplanned work shall be specified with clauses to define emergency exceptions.

These arrangements have to be agreed in advance by both parties to make sure critical services are not affected by planned work and risky operations.

5.4 Support from Network Operation Centre and Service Desk

For most cases, the Network Operation Centre (NOC) needs to be manned 24 x 7 x 365. The NOC will co-ordinate maintenance in close co-operation with the customers, as well as co-ordinating the restoration of services in case of failure. In the case of Critical Times, requirements for expanded on-site support during specific time periods may be agreed upon.

The single point of contact for a network service customer is usually a Service Desk. This needs to answer calls on a 24 x 7 x 365 basis when the service is being provided. For many NSPs the Service Desk function is part of the NOC.

5.5 Fault Management

A *Fault* is the inability of a function to perform a required action[2].

Fault management gives both service providers and media organisations the possibility to detect and locate service Faults. A fault management environment typically uses several sources of information to identify Faults and it interprets this information in combination with the defined Service Level Objectives of an SLA. Alarms shall be assigned and notification can be sent by e-mail or SMS to the provider and/or the client if required.

Level of Fault

It can be useful to distinguish between Faults by taking into account the levels of severity of the consequences on the delivered service. For the purposes of this document, three levels are defined: Anomaly, Defect, and Failure.

An *Anomaly* is the smallest discrepancy which can be observed between the actual and desired characteristics. The occurrence of a single Anomaly does not constitute an interruption in the ability to perform a required function. Anomalies are used as input for performance monitoring and for the detection of Defects. [2]

A *Defect* (or *incident*) is when the density of *Anomalies* has reached a level where the ability to

[2] Definition according to ITU-T G-806 Digital networks – General aspects - Characteristics of transport equipment – Description methodology and generic functionality. Geneva 2012.

perform a required function has been interrupted. Defects are used as input for performance monitoring, the control of consequent actions and for the determination of Fault causes.[3]

A *Defect* should be prioritized, describing the impact and the urgency. A loss of redundancy will normally not breach the SLA but the BMO has to be aware of the exposure to higher risk during the restoration time. It should be noted that restoration time, especially when it involves splicing optical fibres, can take several hours. Also, for some circumstances such as accidents, there is no immediate access allowed from the authorities.

Factors contributing to the impact level of a *Defect* can be the criticality of the NSP service to the business service of the BMO (e.g., a *Defect* concerning the ASI stream to a DVB-S uplink of the BMO will affect all viewers at home whilst a *Defect* on a contribution link could have an influence on only one event) or the number of affected services (e.g. a fibre connection could be used for several Ethernet and video services.) Other factors can be the financial and reputation loss of the BMO.

Impact	Urgency		
	High	Medium	Low
High	1	2	3
Medium	2	3	4
Low	3	4	5

Example of a priority scheme as result of the Impact and Urgency

Priority	Description	Target time to restore the service
1	Critical	5 minutes
2	High	15 minutes
3	Medium	½ hour
4	Normal	3 hours
5	low	6 hours

Example of Target time to restore the service according to the priority of the Defect

A *Failure* happens if a prioritized Defect can't be resolved in the target time specified in the SLA.

Reaction patterns

Arrangements shall be put in to ensure that the NSP has the ability to react to alarms and notifications in a sufficient way.

As part of this, the provider should also take into account service agreements for the equipment involved. This includes details such as the location of spare parts, whether spares cover all situations, and the response time of the vendor to provide repair services at each site along the network route.

Fault reporting

Fault reporting is the way that service Faults are reported and is normally part of the "Service Delivery Report". It provides a short overview of all the Faults (whether Anomalies, Defects or Failures) in a measured period. It is important that every Fault is described with basic information such as a unique number, priority, status, a description, resolution date and time, outage duration, and the impact on the customer.

Escalation procedure

An escalation procedure should be defined, in advance, between the service provider and media organisation to help to reduce escalation time. A communication matrix should be defined and disseminated to the relevant employees, including all the relevant contact information.

The first point of contact is the Service Desk that is available 24 x 7 x 365. It will generate a ticket

[3] Definition according to ITU-T G-806 Digital networks – General aspects - Characteristics of transport equipment – Description methodology and generic functionality. Geneva 2012.

and should manage and resolve most issues. If not, the issue will be escalated to the next level that will be accountable to resolve it. Escalation can continue until the issue reaches CEO level. The figure below outlines a possible escalation matrix of a simple case, more complex schemes may be needed, for instance when there are subcontractors involved.

Disaster Recovery Plan

NSPs and BMOs should ensure that proper means of handling an emergency situation are in place. This includes how the NSP and BMO ensure that the necessary resources are available and ready at all critical sites along the network path.

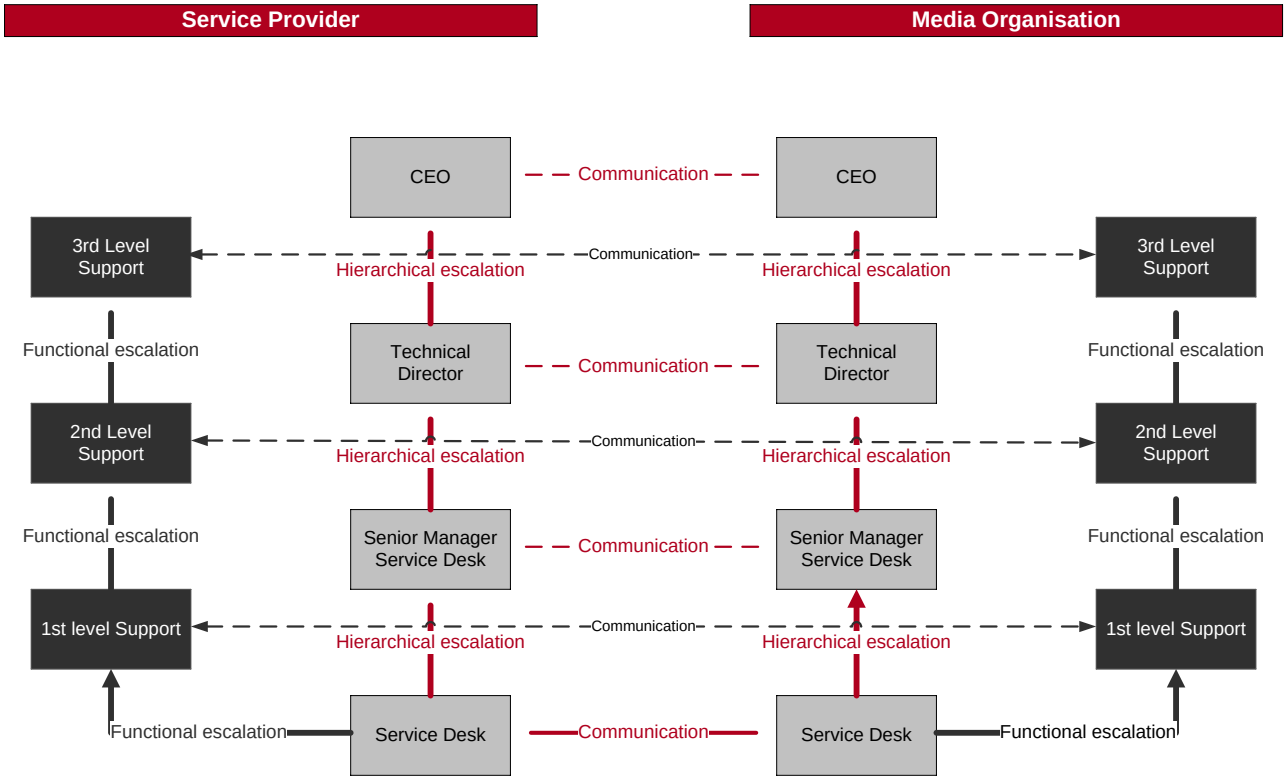

Figure 2: Example of escalation scheme

6. Penalties and Incentives

A conventional SLA contains service penalty schemes written in a way that penalises the NSP in case of Failures.

Failures usually triggers penalties. Such penalties can be defined as a refund of a percentage of the monthly fee (permanent services) or of the total contract value (temporary services). Penalties do not necessarily have to be financial. For instance, additional features or equipment to enhance the service could be offered or credited for a future service.

Penalty Calculation

An SLA should indicate precisely how the penalties are calculated and when the clock starts to tick in the Failure time calculation. Common practice requires the customer to raise the problem to the Service Desk before it can be included in the Failure time calculation.

Permanent vs. Temporary services

Standard penalty schemes for Permanent Services are unlikely to be suitable for Temporary or Occasional Use. In such instances the penalty calculation can be adapted to the requirements of the event, such as by scaling the penalty according to the criticality of the different phases of the event.

Contract termination

Contract termination can be covered in a separate section. This could be useful if a service provider supplies a poor service and/or suffers ongoing or repeated Failures. Conditions for contract termination need to be stated in a quantifiable manner. For example, if Failures cause penalties for a specified percentage of the contract, it can be a cause of contract cancellation. Other examples may include a Service Level Objective not being met on recurring occasions in a specified time period.

Extra Penalty considerations for Broadcast Media Services

The penalty approach of a conventional SLA may not be the most efficient way to achieve the required service level when it comes to media services.

Normally penalties that can be applied for a service contract are usually capped to a percentage of the cost of the service contract for a certain period. For major events, the value of the contribution service is usually only a fraction (i.e., 5% to 10%) of the total budget that includes production costs and rights acquisition; even if it is a critical link of the chain. Therefore, penalty refund is not a guarantee for the value of the content itself and for any damage to reputation and loss of advertising revenues caused by Failure of service links.

In addition, when the maximum amount of penalty is reached during a certain period, the mechanism ceases to be useful to push the provider into continuing the delivery of a quality service.

At the same time, penalties are somewhat like providing an insurance policy and adding more penalty clauses is likely to raise the overall cost of the service in order for the NSP to balance the risks of losing profits.

Strategies other than just penalty schemes could be more efficient in encouraging the proper delivery of the service. Incentives will probably avoid the effect of raising the cost of the service while still providing some leverage for negotiation when a problem occurs. Examples of incentives can be the retention of the last payment until the service is delivered satisfactorily or an option on a future contract.

The best guarantee of good service is to stimulate the common interest of both parties to get the service working rather than having to enforce penalties when service performance is unsatisfactory.

7. Conclusions

For Broadcast Media Organisations the fundamental business requirement when purchasing services from providers is to get a high quality and reliable service that supports media specific demands.

SLA negotiation shall be seen as an opportunity of communication to provide a clear and measureable description of the expected service level. A common understanding by both parties can avoid disputes when service does not meet the customer's expectations.

From a business point of view, an SLA is about managing risks and balancing the cost with the correct level of service. When it comes to solving Faults and Failures, it is a useful procedural guideline to allow both parties to sort things out when the network service does not behave as stipulated.

This document, prepared by the EBU Service Level Agreement (SLA) Project Group as part of the Strategic Programme on Future Networks and Storage Systems (FNS), is intended to give readers a realistic high level view of the components and principles that require careful considerations when preparing an SLA for media transport services. A separate document, concentrating on low level technical parameter descriptions together with a user case, will subsequently be released by the same group.

8. References

These are extra references to the SLA framework in use in the Telecom and IT industries:

- International Telecommunication Union (ITU-T) (2004) Handbook on QoS and Network Performance. Geneva.

- International Telecommunication Union (ITU-T) (2008) Recommendation E.800 Terms and definitions related to quality of service. Geneva.

- International Telecommunication Union (ITU-T) (2002) Recommendation E.860 Framework of a service level agreement. Geneva.

- Information Technology Infrastructure Library (ITIL) (2011) Service Design. United Kingdom.

Annex 1: Contractual Framework

The *Service Contract* covers contractual elements of the purchased service such as cost, legal clauses and signatory parties. It may also include functional specifications such as service descriptions, interfaces, speed, supported protocols and other static parameters (that are required but not measureable), etc.

Service Level Agreement defines in quantitative term the target levels of quality that a service must meet (i.e. the Service Level Objectives). It also defines how these targets shall be monitored and what are the procedures to mitigate problems when a service is disrupted. Other operational aspects, such as delivery conditions and what are the penalties to be applied in case of failure also form part of an SLA.

The following figure shows a typical Contractual Framework made of a Service Contract and a Service Level Agreement.

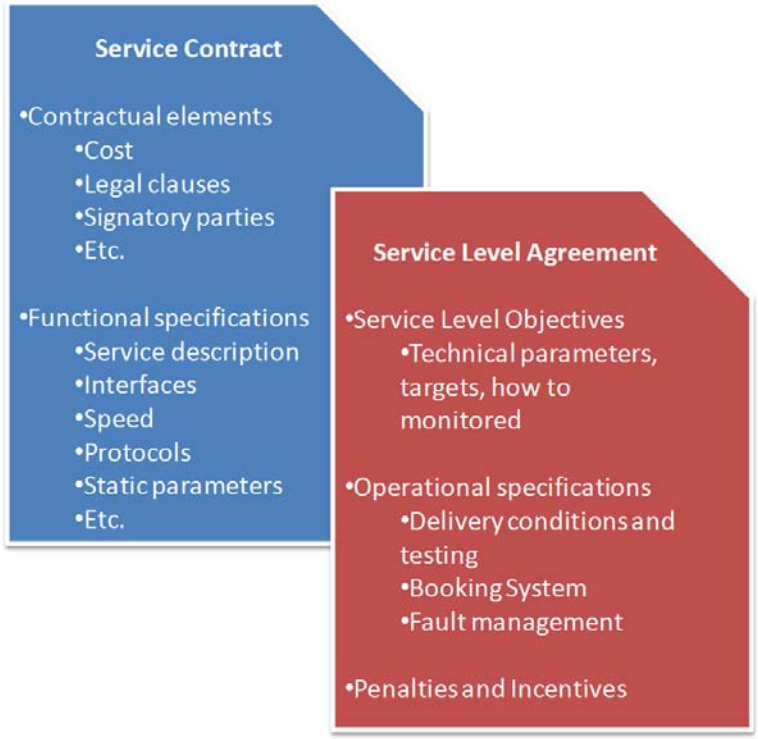

Figure A1: Typical Contractual Framework

Multiple Services

An SLA is often a collection of documents which covers a range of service variants. Each variant may have a separate section in an SLA, and the Service Contract will point out which specific service variant has been agreed upon. In this case, each of them should be described, where relevant, by different elements presented in this document, as shown by the following figure.

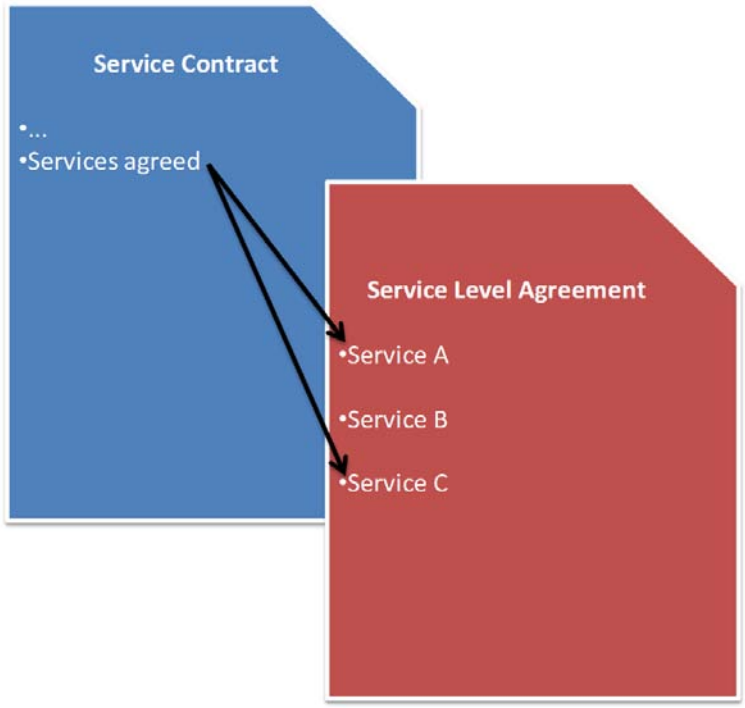

Figure A2: A Service Contract referring to different services in the SLA

End-to-end Service

Typically, for a service involving concatenation of many links in a complex mesh of subcontracts, BMO have to deal with one NSP and sign-up for an end-to-end Service with a single supplier. In this case, BMO may prefer to get information about the complexity and the dependency between underpinning contracts included in the SLA.

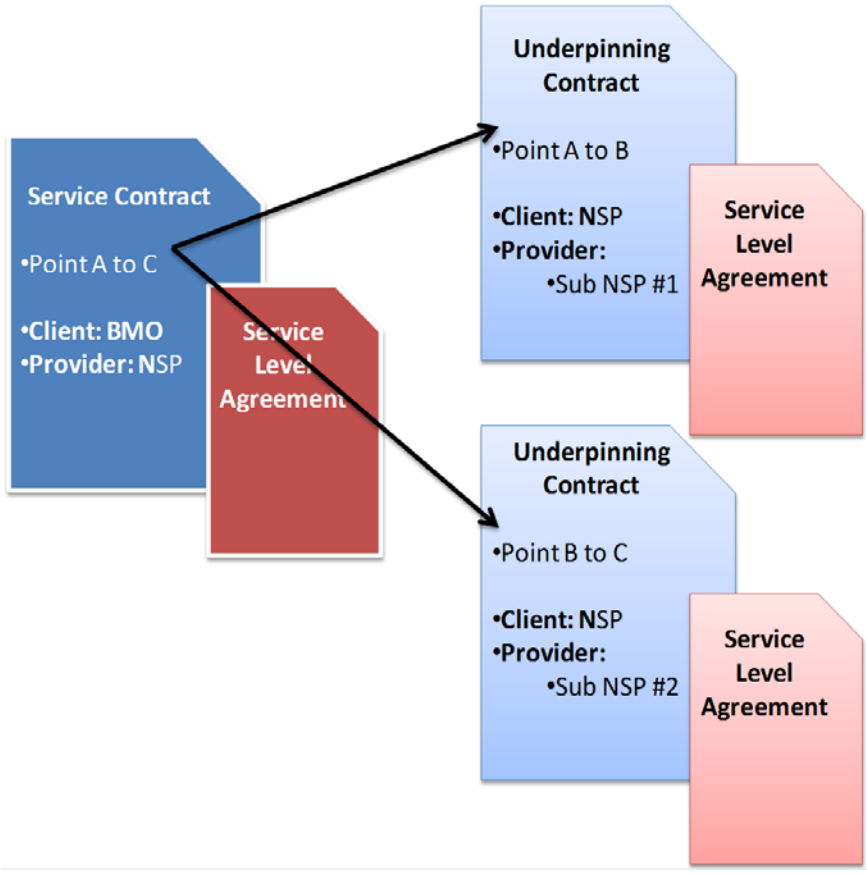

Figure A3: Simple example of a NSP that has subcontracted parts of the service

Workflow of contract negotiations

The procedure of entering a contract for media transport services usually includes at least the following steps:

- Determine the purchase procedure – e.g. a public or limited tendering procedure, or simply acquiring offers from one or a few Network Service Provider. BMOs may be subject to EU procurement rules, which prescribe the types of procedure to use.
- Determine the requirements that should be fulfilled. These include functional and real time or non-real time requirements of the service. The requirements may be posed in the form of a requirement specification or a tender. Here it is vitally important that requirements cover both standard operating modes and Critical Times where relevant.
- Acquire tenders for the contract, and compare these. This comparison may be done as a pure economic consideration, or it can be done as a more holistic assessment. The criteria for winning the contract may be subject to EU procurement rules.
- Negotiate with one or more of the tendering providers, subject to procurement rules where relevant, and optimize the requirements fulfilment versus the pricing.
- Agree the contract that is including the SLA (this may require weeks of negotiation).
- Acquire the requested services from the chosen provider. This includes also monitoring whether the requested service and the requested resources are put timely in place as agreed to.