Guidelines

on

Key Service Level Indicators

for

SWAN Operator

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SWAN Program Office
Department of Information Technology
Government of India

Executive Summary

This document defines various Service Level Indicators for SWAN, which can be considered by the respective States for incorporation in the Service Level Agreement with operator. This document does not detail the associated penalties for the Service Level Indicators and guidance for the same shall be provided separately.

Performance Indicators for SWAN

The Table below summarizes the Performance Indicators for the services to be offered by the SWAN Operator. The SLA targets may be modified by the respective states as considered appropriate. The detailed description of the performance indicators, SLA Terms and their definitions are discussed in the subsequent sections. The vendor shall maintain the SWAN performance as per the SLA indicative targets mentioned below and the planned network outages shall not be considered for SLA measurement.

Table 1: Performance Indicators for SWAN (excluding planned downtime)

Indicative SLA Parameter	SLA Target
Network Availability in SHQ – DHQ during Prime Business Hours (Prime Business Hours = 08:00 hrs to 20:00 hrs Mon. to Sat.)	99.5 %
Network Availability in DHQ – THQ/BHQ during Prime Business Hours	99%
Network Availability in SHQ – DHQ during Extended SLA Hours (Extended SLA Hours = 20:00 hrs to 08:00 hrs – Mon. to Sat. and 00:00 hrs to 23:59 hrs on Sunday)	95%
Network Availability in DHQ – THQ/BHQ during Extended SLA Hours	90%
SWAN Backbone Latency (*in Milliseconds)*	90 ms – 120 ms
SWAN Backbone Packet Loss	<=1 %
SWAN Jitter	30 ms
Internet Availability	95 %
Firewall Outage	0%
IDS Outage	0%
Denial of Service	15 Minutes *
SLA Reporting	Fortnightly basis.

* The operator shall respond to Denial of Service attacks reported by departments/SWAN users or SWAN maintenance personnel within 15 minutes of intimation to the helpdesk.

Network Operations Management

Severity	Initial Response Time	Issue Resolution Time
Level 1	15 Mins	1 Hr
Level 2	30 Mins	2 Hrs
Level 3	60 Mins	8 Hrs

Other Network Parameters to be monitored by the Operator

Description	Max Utilization Level
CPU Utilization	80%
Memory & Buffers	70%
Link Utilization	70%

Each of the indicators mentioned in the table above are detailed in the following section.

2.a. Network Availability

The critical consideration for the State government in defining the SLA for availability is the impact on overall cost of the solution. It should be noted that higher the SLA, the solution is essentially more expensive. While defining the SLA for availability, certain critical points need to be assessed by the State governments. In section Annexure 1(f) of this document, illustrative parameters to be evaluated for defining the network availability requirements have been indicated.

The Network Availability SLA defined for the SWAN Operator is dependent on the Network Availability SLA agreed by the State Government with the Bandwidth Service Provider. e.g. If the State Government agreed for 99 % of SLA with the bandwidth provider, the network availability SLA for the SWAN Operator shall be 99.5 % of 99% SLA defined for Bandwidth Provider.

SLA Parameter	**Network Availability**		
Network Segment	**Network Outage**		**Remarks**
	PBH	**ESH**	
SHQ-DHQ	99.5 %	95 %	SLA allows approximately four hours of down time in the connectivity between the State Head Quarters and the District Head Quarters.
DHQ-THQ	99%	90%	SLA allows approximately 7 hours of aggregate down time in the connectivity between the District Head Quarters and the Taluk Head Quarters.

2.b. SWAN Backbone Latency

The Latency on the SWAN Backbone shall be maintained at (i) 90 milliseconds or less for the District level Network and (ii) 120 milliseconds or less for the Taluk/Block level Network.

Latency for Voice & Video Applications: As a delay-sensitive application, voice cannot tolerate much delay. Latency is the average travel time it takes for a packet to reach its destination. If bandwidth utilization is high, the voice packet will be delayed to the point that the quality of the call is compromised. The maximum amount of latency that a voice call can

tolerate one way is typically 150 milliseconds (100 milliseconds is optimum). Similar latency requirements exist for video traffic also ranging 150-200 ms one way.

SLA Parameter	**SWAN Backbone Latency**	
Network Segment	**Network Latency**	**Remarks**
SHQ-DHQ	90 MS	SLA allows a maximum of 90 Milliseconds in the connectivity between the State Head Quarters and to all the District Head Quarters.
DHQ-THQ	130 MS	SLA allows a maximum of 90 Milliseconds in the connectivity between the District Head Quarters to all the Taluks or Blocks.

2.c. SWAN Backbone Packet Loss

The Packet Loss on the SWAN Backbone shall be maintained typically at less than 1% measured on a monthly basis.

Packet loss for voice and video applications: Dropped voice packets are the discarded packets which are not retransmitted. Voice traffic can tolerate typically less than a 3 percent loss of packets (1% is optimum) before end users experience disconcerting gaps in conversation. Similarly video applications can not tolerate typically a packet loss > 1%.

SLA Parameter	**Packet Loss**	
Network Segment	**Packet Loss**	**Remarks**
SHQ-DHQ & DHQ-THQ	<=1%	SLA allows a maximum of 1% of packet loss in the connectivity between the State Head Quarters and to all the District Head Quarters.

2.d. SWAN Average and Maximum Jitter

States shall aim to keep Average Jitter on the SWAN Backbone typically to 20 microseconds or less; and for Maximum Jitter typically not to exceed 30 milliseconds. Jitter shall be measured by averaging sample measurements taken during a calendar month between Hub Routers.

Jitter for Voice and Video Applications: In order for voice to be intelligible, consecutive voice packets must arrive at regular intervals. Jitter describes the degree of variability in packet arrivals, which can be caused by bursts of data traffic or just too much traffic on the line. Voice packets can tolerate typically about 75 milliseconds (40 milliseconds is optimum) of jitter delay. For video applications to work on SWAN, Jitter should be typically less than < 30ms.

SLA Parameter	**Gitter**	
Network Segment	**Gitter**	**Remarks**
Average Jitter	250 Microseconds	
Maximum Jitter	10 Milliseconds	

2.e. Internet Availability

SLA Parameter	**Internet Availability**	
Network Segment	**%**	**Remarks**
Overall Internet Availability	95	SLA allows a maximum of 7 hours internet services unavailability per month.

2.f. Firewall Outage

SLA Parameter	**Firewall Outage**	
Network Segment	**Firewall Outage**	**Remarks**
Internet Firewall Availability	0 %	SLA allows no down time in the Internet firewall availability.
Intranet Firewall Availability	0 %	SLA allows no down time in the Intranet firewall availability.

2.g. IDS Outage

SLA Parameter	**IDS Outage**	
Network Segment	**IDS Outage**	**Remarks**
IDS for In Bound & Outbound Traffic	0 %	SLA allows no down time in the IDS deployed inbound

		traffic to SWAN.

3. Denial of Service

Denial of Service (DoS) is the most common form of attack on the Network, which leads to network unavailability for the genuine network users. The operator shall respond to Denial of Service attacks reported by departments/SWAN users or SWAN maintenance personnel within 15 minutes of intimation to the helpdesk. The Denial of Service attack can be defined as sudden burst of network traffic leading to more than 90-95% utilization of the SWAN bandwidth in any segment or complete network. In such a scenario operator shall perform an analysis of the issue, verify whether the network utilization is due to genuine user requirements or it is a denial of service attack. In case it is identified as DoS attack, operator shall identify the source of Denial of Service attack, and shall disconnect the source or network from SWAN backbone and resolve the issue to ensure availability and performance of the backbone.

The SWAN Operator, at regular intervals, shall monitor and measure the actual bandwidth allocated by the Bandwidth Provider against the agreed Committed Interface Rate (CIR) and issues identified shall be reported to the State Project Management Unit (PMU) and shall be escalated to the Bandwidth Service provider for resolution.

4. Network Operations Management

The operator is required to establish Contact Center (Helpdesk) at the State level (*with a toll free number)* with an appropriate CRM Solution. The Helpdesk shall act as a SPOC (Single Point of Contact) for all the Network & Security related issues reported by the government departments or any other related stakeholders of the SWAN. Each issue need to be recorded in the CRM as a Service Request (with allocation of service request number) and the resolution timelines for such Service Requests shall be monitored by SWAN Project Management Unit (PMU) established by the State.

S.No	Severity	Initial Response Time	Issue Resolution Time
1	Level 1	15 Mins	1 Hr
2	Level 2	30 Mins	2 Hrs
3	Level 3	60 Mins	8 Hrs

4.1. Severity Level Definition

Level 1:	The network outage, security or performance related issues impacting the network availability/performance and leading to unavailability of the services in one or more Districts.
Level 2:	The network outage, security or performance related issues impacting the network availability/performance and leading to unavailability of the services in one or more Taluks/Blocks.
Level 3:	The network outage, security or performance related issues impacting the network availability/performance and leading to unavailability of the services to one or more departments in Taluk/Block.

5. Capacity and Performance Management

The SWAN operator shall provide capacity planning services through network base lining and trending, to determine the resources required for SWAN and to plan and complete network upgrades before a capacity problem causes SWAN down time or performance problems. In addition to availability, latency, jitter and packet loss, SWAN operator shall monitor the network and dependent infrastructure (*resource*) utilization during successive time periods (*hour, day, week, month, and year*) and shall provide recommendations to State government on SWAN infrastructure upgration. SWAN operator shall perform the planned network upgrades with prior notification to the departments/users in the network segment (s) affected by the planned outages. SWAN operator should ensure that all the planned outages are performed only in the Extended SLA Hours and only the emergency upgrades are performed in the Prime Business Hours.

The overall responsibility of ensuring the SWAN performance rests with the SWAN operator and the following are critical areas in performance management which shall be monitored by the SWAN operator on a constant basis.

- CPU utilization
- Backplane or I/O
- Memory and buffers
- Link Utilization

i. CPU Utilization

CPU is used by both the control plane and data plane on any network device. In capacity and performance management, SWAN operator must ensure that the device and network have sufficient CPU capacity to function at all times. SWAN operator shall configure the NMS to monitor the CPU utilization of the critical network devices implemented in PoP's. In case the average CPU utilization is above 80 % on a continuous basis, SWAN operator shall perform the diagnostic review of the device and provide recommendations on addressing the issue. SWAN operator shall own the overall responsibility of the performance and shall accordingly escalate any performance related issues to the state government.

ii. Backplane or I/O

Backplane or I/O refers to the total amount of traffic that a device can handle, usually described in terms of BUS size or backplane capability. Any issues with backplane or I/O need to be monitored and recommendations need to be provided to address the performance issues.

iii. Memory and buffers

Memory is another resource that has data plane and control plane requirements. When devices run out of memory, operations on the device can fail. In case the average memory utilization is above 70 % on a continuous basis, SWAN operator shall perform the diagnostic review of the device and provide recommendations on addressing the issue. SWAN operator shall own the overall responsibility of the performance and shall accordingly escalate any performance related issues to the state government.

iv. Link Utilization

SWAN operator shall monitor the utilization of SWAN links across the segments to verify the current utilization and the trends to ensure that enough bandwidth is made available for the applications and services to function with out performance issues. SWAN operator shall provide fortnightly reports on the link utilization and in case the link utilization on a constant basis is exceeding 70 %, SWAN operator shall provide recommendations to the State government on procurement of additional bandwidth.

6. Measurement of SLA

The Measurement of SLA shall be performed by a third party agency, independent of the SWAN Operator, to be identified by the State Government.

The Operator shall establish an Enterprise/Network Management System for monitoring and measurement of the SLA parameters identified for the SWAN's. The NMS/EMS implemented for SWAN shall conform to the open network management standards such as Simple Network Management Protocol and Remote Monitoring (RMON) features. State reserves the right to periodically change the measurement points and methodologies it uses without notice to the Operator.

7. SLA Reporting

For reports of performance of the SWAN Backbone, the operator is required to setup a portal solution available to the SPMU to be established at the State level for SWAN Implementation. This portal shall provide online performance and availability reports of SWAN. The operator shall submit SLA reports to the State PMU on a fortnightly basis.

Annexure 1: SWAN SLA Terms & Definitions

S.No	SLA Terms	Description
a	SWAN Backbone	'SWAN Backbone' refers to Internet Protocol (IP) based routing infrastructure consisting network of selected SWAN points of presence identified by the State at which, SWAN operator has installed network devices ("Selected POPs") for Wide Area Network within the State.
b	Uptime	'Uptime' refers to SWAN backbone availability across various segments i.e. between State Head Quarters to District Head Quarters and District Head Quarters to Taluk/Block Head Quarters. "%Uptime" means ratio of 'up time' (in minutes) in a month to Total time in the month (in minutes) multiplied by 100.
c	Latency	'Latency' refers to the average time required for round-trip packet transfers between Selected POPs on the selected portions of the SWAN Backbone during a calendar month.
d	Packet Loss	'Packet Loss' refers to the average percentage of IP packets transmitted between Selected POPs during a calendar month that are not successfully delivered.
e	Average Jitter	'Average Jitter' refers to the average variation in delay for packet transfers between Selected POPs during a calendar month.
f	Maximum Jitter	'Maximum Jitter' refers to the maximum variation in delay for packet transfers between Selected POPs.
g	SHQ	SHQ refers to the PoP established at State Head Quarters (SHQ) where all the WAN circuits from District Head Quarters (DHQ)/Divisions are terminated.
h	DHQ	DHQ refers to the PoP established at District Head Quarters (DHQ) where all the WAN connections from Taluk's in the district and to the SHQ are terminated.
i	THQ/BHQ	THQ/BHQ refers to the PoP established at the Taluk or Block level and which also acts as an entry point for the Government agencies located

S.No	SLA Terms	Description
		in the Taluk/Block or village etc.
j	Prime Business Hours (PBH)	PBH refers to the prime network utilization period for SWAN, which shall be typically starting from 08:00 hrs till 20:00 hrs Monday to Saturday or any other period to be defined by the state.
k	Extended SLA Hours (ESH)	ESH refers to the lean network utilization period for SWAN, which shall be typically starting from 20:00 hrs till 08:00 hrs on Monday to Saturday and 00:00 hrs to 23:59 hrs on Sunday or any other period to be defined by the state.
l	Planned Network Outage	'Planned Network Outage' refers to unavailability of network services due to infrastructure maintenance activities such as configuration changes, up gradation or changes to any supporting infrastructure. Details related to such planned outage shall be agreed with the State government and shall be notified to the DHQ's, THQ/BHQ's and related Departments in advance (*at least five working days)*.
m	Unplanned Network Outage	'Unplanned Network Outage' refers to an instance in which no traffic can pass in or out of the Selected POP through which Departments connects to the SWAN Backbone for more than 5 consecutive minutes.
n	SPMU	The State Government shall establish the SWAN PMU consisting of nodal officers with relevant skill sets and which shall remain intact during the complete life cycle of the SWAN Project i.e. for a period of Five Years.