Office of Internal Oversight Services

INTERNAL AUDIT DIVISION

REPORT 2017/127

Audit of arrangements to ensure the adequacy of the network bandwidth in the field operations of the Office of the United Nations High Commissioner for Refugees

There was a need to revise the criteria for establishing per capita bandwidth, centralize bandwidth capacity planning and procurement, improve monitoring of bandwidth usage and connectivity at staff accommodations, as well as deploy network optimization processes

6 December 2017
Assignment No. AR2017/166/01

Audit of arrangements to ensure the adequacy of the network bandwidth in the field operations of the Office of the United Nations High Commissioner for Refugees

EXECUTIVE SUMMARY

The Office of Internal Oversight Services (OIOS) conducted an audit of arrangements to ensure the adequacy of the network bandwidth in the field operations of the Office of the United Nations High Commissioner for Refugees (UNHCR). The objective of the audit was to assess whether UNHCR has adequate arrangements in place to ensure that its field offices have the required bandwidth to implement their activities in an efficient and cost-effective manner and in compliance with the policy and business performance requirements. The audit covered the period from 1 January 2016 to 30 June 2017 and included a review of: (a) regulatory framework; (b) capacity planning and management; (c) monitoring and reporting; and (d) bandwidth for staff welfare activities.

UNHCR had established a process to assess the bandwidth capacity requirements in the field offices and to monitor network performance. However, for its smooth functioning, UNHCR needed to ensure that: (a) the guidance for the establishment of per capita bandwidth allocation is revised; (b) the Division of Information Systems and Telecommunications (DIST) plays a central role in bandwidth capacity planning, procurement and management for field offices; (c) monitoring of bandwidth usage is improved; (d) network optimization processes are implemented in locations where establishing quality of service is not feasible: and (e) there is adequate coordination between DIST and the Division of Human Resources Management (DHRM) for providing internet connectivity at UNHCR-provided staff accommodations.

OIOS made five recommendations. To address issues identified in the audit, UNHCR needed to:

- Review and update the Connectivity Strategy and Capacity Management guidance to better reflect bandwidth estimation and calculation, including consideration of the number of devices on the network;
- Assign DIST to lead the discussions on the need for it to be assigned a central role in capacity planning, procurement and management of field office bandwidth, agree the resulting budgetary changes between DIST, the Regional Bureaux and the Division of Financial and Administrative Management, and review and modify the 2015 Operational Guidelines for Budgeting and Procurement of Information and Communication Technology Equipment and Services to reflect these changes;
- Ensure appropriate monitoring of bandwidth use across all UNHCR sites;
- Implement the processes required to ensure that the necessary bandwidth is allocated to meet the professional and personal requirements of users in locations where the quality of service mechanism is not feasible or available; and
- Establish a mechanism, based on the requirements and appropriate coordination between DIST and DHRM, for the provision and monitoring of internet connectivity at staff accommodations.

UNHCR accepted the recommendations and has initiated action to implement them.

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Audit of arrangements to ensure the adequacy of the network bandwidth in the field operations of the Office of the United Nations High Commissioner for Refugees

I. BACKGROUND

1. The Office of Internal Oversight Services (OIOS) conducted an audit of arrangements to ensure the adequacy of the network bandwidth in the field operations of the Office of the United Nations High Commissioner for Refugees (UNHCR).

2. It is a mission critical requirement that UNHCR maintains reliable communication links at the local and international level, including provision of voice and fax communication, email, connectivity to the internet, and shared data repositories. UNHCR also needs to ensure continued access to the most critical information and communications technology (ICT) data and centralized applications to secure uninterrupted day-to-day business operations. Adequate bandwidth is a key requirement for delivering data-intensive applications and services through high-speed networks. For humanitarian organizations like UNHCR, which has extensive field operations, high network availability is a crucial requirement.

3. The ICT Network and Telecoms Section under the Division of Information Systems and Telecommunications (DIST) is responsible for the overall delivery of Local and Wide Area Network services on which all other services rely. In particular, and through third party managed service providers, the Service Delivery Team of the Section manages the global Very Small Aperture Terminal (VSAT) network and internet links, radio and microwave links, and any other common standard telecommunications services required, and ensures that these services are fit for purpose. The Section is also responsible for the network and telecommunications strategy of DIST through the Solution Architecture Team, which continually looks for new and novel ways to increase efficiency of the network and extend its reach to the final point of delivery in deep-field locations.

4. The 2015 Operational Guidelines for Budgeting and Procurement of ICT Equipment and Services stipulated that UNHCR offices should, to the extent possible, have multiple (dual) and separate internet connections. In developed locations where multiple, reliable local Internet Service Providers (ISP) exist, this may simply be primary and secondary connections from two local ISPs. VSAT is typically used when there is limited or no local ISP. In locations where no reliable ISP is available and the primary internet connection is via VSAT, alternate backup or secondary connection should be ensured. The local and regional ICT staff can advise on the types of service and bandwidth required based on the activities in the office and number of staff.

5. According to DIST, there were about 440 active and connected UNHCR sites at the time of the audit. About 170 were connected through a VSAT and ISP combination and the rest were through ISPs. In 2016, UNHCR incurred expenditures of $8 million for VSAT and $4 million for ISPs services. The budget for connectivity for 2017 remained at the same level.

6. Comments provided by UNHCR are incorporated in italics.

II. AUDIT OBJECTIVE, SCOPE AND METHODOLOGY

7. The objective of the audit was to assess whether UNHCR has adequate arrangements in place to ensure that field offices have the required bandwidth to implement their activities in an efficient and cost-effective manner and in compliance with the policy and business performance requirements.

8. This audit was included in the 2017 risk-based work plan of OIOS due to the risks associated with inadequate bandwidth management which could lead to uncontrolled traffic on network, unscheduled downtime, limited visibility of network traffic, slow applications, network congestion and weak network performance.

9. OIOS conducted the audit from May to October 2017. The audit covered the period from 1 January 2016 to 30 June 2017. Based on an activity-level risk assessment, the audit covered higher and medium risk areas in network bandwidth management, which included: (a) regulatory framework; (b) capacity planning and management; (c) monitoring and reporting; and (d) bandwidth for staff welfare activities.

10. The audit methodology included: (a) interviews of key personnel; (b) review of relevant documentation; (c) analytical review of data from network monitoring tools; and (d) sample testing of performance parameters utilizing performance information obtained from UNHCR's network monitoring tools. The audit reviewed data relating to 45 locations in 22 countries (in Great Lakes, East Africa, West Africa, Southern Africa, Central Asia, and Middle East) and included a combination of VSAT services and local ISPs. The audit team also visited four UNHCR offices in Kenya - the Representation in Nairobi and its Sub-Office in Dadaab, the Regional Service Centre in Nairobi, and the Somalia Office in Nairobi - to review the bandwidth management processes.

11. The audit was conducted in accordance with the International Standards for the Professional Practice of Internal Auditing.

III. AUDIT RESULTS

A. Capacity planning and management

The per capita bandwidth allocation guidance needed revision

12. DIST had developed internal guidance on bandwidth management in a document entitled 'Connectivity Strategy and Capacity Management', drafted in 2016 and finalized in August 2017. The document established capacity recommendations for internet links to enable UNHCR users to comfortably use the ICT services for corporate and internet traffic. It also determined the bandwidth capacity requirements of each office based on the number of users, type of service provider (VSAT or ISP) and their reliability, type of traffic such as corporate, internet or disaster recovery traffic, growth expected, and other external factors. DIST had also established a capacity management board that comprised of network solutions engineers and service delivery managers to assess and recommend changes in architecture, configuration and capacity of VSAT and ISP links in field offices.

13. DIST estimated that a standard UNHCR user required a minimum of 120 kilobits per second (kbps) for performing their work. However, because of the bursting features (accommodation of temporary increase in usage) available to UNHCR in VSAT-connected sites, bandwidth requirements for sites using VSAT for Internet access could be lower per user. Table 1 shows the dual links sizing scenarios defined by DIST stating that wherever possible, scenario one is the preferred option as it factored in the redundancy between the two links:

Table 1: Minimum sizing scenarios

	Scenario 1: Corporate + Internet (download speeds)		Scenario2: Corporate + Internet + Disaster Recovery (download speeds)	
	Primary - Corporate	**Secondary – Internet (including guest wi-fi)**	**Main Link - Corporate and Internet**	**Guest WIFI - Disaster Recovery Link**
VSAT	20 kbps/user (only UNHCR users)	40 kbps/user (all users)	60 kbps/user (all users)	30 kbps/user (all users)
ISP	40 kbps/user (only UNHCR users)	80 kbps/user (all users)	120 kbps/user (all users)	60 kbps/user (all users)

14. Reports on the capacity assessment reviews in 20 locations were available in the Central ICT Management Tool. OIOS obtained examples of the capacity assessment reviews carried out by DIST in three locations and actions taken to resolve the problems. OIOS assessed that the process was functioning satisfactorily.

15. To confirm the appropriateness of the methodology of per capita allocation in the DIST guidance, OIOS reviewed 24,300 records from the network level monitoring tool that comprised minute by minute traffic volume for nine core hours (9 am to 6 pm on 3 May 2017 or 540 minutes of internet traffic per site) related to 45 sites (19 VSAT or 10,260 minutes and 26 ISPs or 14,040 minutes) in 22 countries. Based on the calculation of total number of staff members over the total volume of incoming traffic, recommended kbps per user, and the committed information rate (contracted from vendor) per staff member, OIOS observed the following:

- Usage of bandwidth in 35 offices (22 ISP and 13 VSAT) was below both the recommended capacity (20 kbps – 80 kbps range) and the contracted committed information rate, which indicated that there was sufficient capacity to meet peaks of applications throughput and future demand;

- Six VSAT locations consumed more bandwidth than the recommended bandwidth ranges and the contracted committed information rate and thus faced the risk of network saturation in case of bursting constraints; and

- No data was available for four locations (either the monitoring service did not work or the service with the VSAT/ISP selected for review was not in place at that time).

16. OIOS reviewed the existing criteria for allocating bandwidth and assessed that the criteria used by UNHCR was outdated and required revision to ensure equitable allocation of bandwidth. The guidance did not mention the number of devices in use as a criterion. DIST explained that bandwidth requirements were calculated irrespective of the number of devices, as it was assumed that each user would use only one device at a time. The other devices, though connected to the network, would be generally inactive and, hence, would be low on bandwidth consumption.

17. During the visit to UNHCR offices in Kenya, OIOS observed that the number of devices that were connected to the network was significantly higher than the number of staff. For instance, the UNHCR

Representation in Nairobi had 200 staff, while the number of network connections at the time of audit was 427. Similarly, against the 190 staff in the Sub-office Dadaab, the number of devices connected was 550. The ICT teams in these offices explained that every staff member had at least three devices – a desktop, a smartphone and a personal laptop – all connected to the UNHCR network. Furthermore, the number of devices increased with the remoteness of the office location. These devices, in particular smartphones, generated increased network traffic due to regular updates to the applications installed on them. Also, with the migration to a cloud based email system, a significant number of users downloaded their emails on all their devices.

18. Based on the situation observed in Kenya and the multiple devices connected to the network, OIOS was of the view that the calculation of bandwidth requirements should also take into consideration the number of devices connected to the network, rather than just the number of staff. UNHCR's assumption that only one device per person would be active at any point in time may not be valid since there could be background internet usage (processes such as download of updates to applications or operating systems when a device is not in active use) that needed to be considered. OIOS accordingly reassessed the requirements across UNHCR conservatively assuming that each staff member would have two devices connected to the network. Based on the revised calculations, OIOS concluded that all locations with the exception of two – the UNHCR Representation in Nairobi and the UNHCR Representation in Ndjamena, Chad – would have adequate bandwidth. Nevertheless, DIST agreed to modify the internal guidance on bandwidth management to reflect this issue.

(1) The UNHCR Division of Information Systems and Telecommunications should review and update the Connectivity Strategy and Capacity Management guidance to better reflect bandwidth estimation and calculation, including consideration of the number of devices on the network.

UNHCR accepted recommendation 1 and stated that DIST would review and update the "Connectivity Strategy and Capacity Management" guidance taking into account the recommendations of this audit and the progressive deployment of new applications. DIST would also take into consideration the average number of devices per user and adjust the guidance accordingly. Recommendation 1 remains open pending revision of the Connectivity Strategy and Capacity Management guidance to better reflect bandwidth estimation and calculation, including consideration of the number of devices on the network.

<u>There was a need to ensure that DIST has centralized responsibility for bandwidth capacity planning, procurement and management</u>

19. According to Chapter 2 of the UNHCR Manual, DIST has overall responsibility for: (a) delivering and maintaining the common ICT infrastructure underlying the provision of all ICT services, such as local and wide area network services on which all other services rely; and (b) increasing the efficiency of the network and extending its reach to the final point of delivery in deep-field locations. The 2015 Operational Guidelines for Budgeting and Procurement of ICT Equipment and Services specify that DIST would centrally make provisions for operating costs of the VSAT network, but field offices would be responsible for the one-time procurement and related transportation and installation costs. The 2015 Operational Guidelines specify that field offices are responsible for procuring and paying for primary and secondary ISP links, with DIST bearing no responsibility in this regard.

20. OIOS observed that the current organizational arrangements were not conducive to efficient and cost-effective management of bandwidth. For example:

- A review of procurement costs for VSAT services showed that fixed and one-time installation cost was estimated at $60,000 while the recurring costs, depending on the bandwidth, could vary from $36,000 to $90,000 per year. On average, the annual costs for sourcing internet services from ISPs ranged from $2,400 to $30,000 and were accordingly significantly cheaper. However, there was a risk that field offices with VSAT connectivity would not regularly assess the evolving or developing local market to obtain similar level of service from an ISP because they would have to pay for such services from their own budgetary allocations. For example, in Harare, Zimbabwe where the primary connectivity was through VSAT and the secondary connectivity was through an ISP, DIST assessed that shifting from VSAT to a local ISP that provided quality services at an optimum cost would enable UNHCR to save about $36,000 a year.

- OIOS observed that the UNHCR Representation in Nairobi could also save about $ 36,000 a year by reducing its VSAT bandwidth to a quarter of the current capacity. The resulting savings could be used to source a third connection from another ISP. Such an arrangement would more than double the bandwidth availability. The Regional Service Centre in Nairobi had already started a process to identify a reliable ISP after downsizing its VSAT connectivity. Likewise, there was a potential for Sub-office Dadaab to reduce the VSAT capacity to the minimum and use the resulting savings of about $12,000 to add additional capacity from an ISP.

- The choice between VSAT and ISP depends on various technical and economic parameters. UNHCR field offices could not make informed choices on technical aspects of internet procurement as they lacked the requisite knowledge and resources to perform such assessments.

21. As a result of the above, there was a risk of UNHCR continuing to pay a higher cost for connectivity while better and cost-effective solutions were not adequately explored or used. These conditions arose because DIST was not empowered to make timely choices on procuring internet services corporate-wide.

(2) The UNHCR Division of Information Systems and Telecommunications should: (a) lead the discussions on the need for it to be assigned a central role in capacity planning, procurement and management of field office bandwidth; (b) agree the resulting budgetary changes with the Regional Bureaux and the Division of Financial and Administrative Management; and (c) review and modify the 2015 Operational Guidelines for Budgeting and Procurement of ICT Equipment and Services to reflect these changes.

UNHCR accepted recommendation 2 and stated that DIST would work together with the Division of Financial and Administrative Management (DFAM) and the Regional Bureaux to identify the appropriate modalities to comply with this recommendation. The "Operational Guidelines for Budgeting and Procurement of ICT Equipment and Services" would be reviewed accordingly. Recommendation 2 remains open pending issuance of the relevant administrative instruction in agreement with DFAM and the Regional Bureaux and revision of the operational guidelines confirming DIST's lead role in capacity planning, procurement and management of field office bandwidth.

B. Performance monitoring and reporting

Monitoring of bandwidth usage needed improvement

22. Pursuant to the United Nations Secretary-General's Bulletin ST/SGB/2004/15, Section 8 on the Use of Information and Communication Technology Resources and Data, technical monitoring of ICT resources shall be routinely performed for troubleshooting, diagnostics, statistical analysis and performance

tuning. UNHCR's Connectivity Strategy and Capacity Management guidance prescribed performance metrics for packet loss, latency and availability for different types of connectivity. For the primary link, the recommended acceptable criteria were 99 (99.5 for VSAT) per cent availability, while the packet loss parameter was <= 1 per cent and the round-trip time (RTT) was <250 ms or milliseconds (<600 ms for VSAT).

23. DIST had put in place tools at the network and application layers to monitor the performance of the UNHCR network. The network layer tool provided an overview of the bandwidth use in an office from every 15 seconds to 24 hours, while the application layer tool enabled monitoring the use of the non-core applications that dominated the bandwidth available. These tools enabled DIST to monitor the bandwidth, packet loss and latency of the internet connections of the UNHCR field offices. They sent out alerts to DIST network team and the managed service provider for infrastructure when anomalies were spotted.

24. OIOS reviewed historical data of 22 connection links and noted no major RTT issues or significant packet losses. In this respect, out of the cumulative 15,660 minutes of internet traffic data that were reviewed, OIOS noted that 13,650 minutes (87 per cent) complied with the RTT criteria. About 90 per cent of the RTT issues related to certain specific locations, such as Kilinochi in Sri Lanka, Alma-Ata in Kazakhstan, the Somalia Office in Kenya, Obock in Djibouti, and Mogadishu in Somalia. There was no disruption to the availability (or downtime) of connectivity. However, packet loss was noted in 380 instances (2.5 per cent), which was in excess of the acceptable norm of 1 per cent. Most of the packet losses occurred in Maputo, Mozambique (over 52 per cent), followed by the Somalia Office in Kenya, Erbil in Iraq and Qubayyat in Lebanon at 12 per cent each. Most of these deficiencies occurred in the services provided by local ISPs for which effective service level agreements were not available for review.

25. At the time of its field visits, OIOS requested the ICT staff in the Somalia Office and the Regional Service Centre in Nairobi to test the connection links for RTT and packet loss issues. The results were satisfactory as the data returned was within the values prescribed in the connectivity strategy. However, the following shortcomings were identified in the monitoring by DIST:

- As per the overall UNHCR staffing table at the end of June 2017, there were 475 locations worldwide. However, DIST's connectivity information disclosed only 440 locations. The variance was due to lack of synchronization between the Division of Human Resources Management (DHRM) records and DIST records and indicated that in 35 locations no performance monitoring took place.

- Out of the 440 UNHCR offices that existed in DIST's records, about 80 serviced by ISPs were not subject to bandwidth use monitoring by DIST and these locations included sub-offices, field offices, liaison offices, camps and partner offices. These offices had some 600 staff, or 5 per cent of the total UNHCR workforce. DIST explained that the monitoring tool at the network layer had been installed at all sites that used the upgraded infrastructure, but did not cover the 80 offices that used legacy infrastructure.

- As mentioned in paragraph 23, DIST also used another tool at the application layer to monitor bandwidth use. This tool enabled it to identify and liberate bandwidth consumed by users on unauthorized applications or when sufficient bandwidth was not available for running corporate applications for a long duration. This application level monitoring was done only in 150 offices or one third of all locations. DIST explained that, for cost reasons, the monitoring tool was installed in specific field locations only when requested.

26. Consequently, DIST did not monitor internet traffic across all sites. As a result, connectivity and performance issues remained undetected for non-monitored sites.

(3) The UNHCR Division of Information Systems and Telecommunications should ensure appropriate monitoring of bandwidth use across all UNHCR sites.

UNHCR accepted recommendation 3 and stated that DIST would need to extend its monitoring capacity to additional offices, beyond the 395 offices that were monitored today. This would require budget and local implementation of equipment and tools. As this was not realistic for all UNHCR field locations, DIST would ensure that the criteria for exclusion is defined in the revised "Connectivity Strategy and Capacity Management" guidance. Recommendation 3 remains open pending implementation of appropriate actions for monitoring of bandwidth use across all UNHCR sites and receipt of the revised Connectivity Strategy and Capacity Management guidance that reflects the exclusion criteria for bandwidth monitoring at field offices.

There was a need to implement optimization processes where the quality of service is not feasible

27. Quality of Service (QoS) features provide the ability to prioritize bandwidth utilization across a network and over data sources, data types, users and other network criteria. QoS mechanisms manage the priorities of bandwidth utilization for different services, users, applications etc. over network connections, to ensure steady throughput for these connections. QoS should be utilized to ensure that any traffic related to critical business operations is prioritized. Given the increasing amount of interactive applications (particularly voice, video, and immersive applications), real-time services are often required from the network. Because these resources are finite, they must be managed efficiently and effectively.

28. DIST had implemented QoS and optimization for VSAT links to prioritize corporate traffic (such as prioritizing voice/video over other corporate applications). This accounted for about 170 out of 440 locations. For the remaining locations that were connected only by ISPs, implementation of QoS was not possible, which could affect the performance of bandwidth intensive corporate applications such as proGres version 4. Furthermore, optimization tools were not implemented in such instances. As a compensating control, DIST had in place an application level monitoring tool to monitor/police the traffic, although this process was not as efficient as the QoS over VSAT links. In addition, this monitoring tool did not distinguish between the requirements of individual users who might need access to bandwidth hungry applications such as YouTube for professional reasons and the requirements of other users who wanted to access them for entertainment reasons after work hours or during weekends. Also, the tool allocated bandwidth for certain websites (such as YouTube and Facebook) in a given location and restricted all users in that location to the allocated bandwidth regardless of time. As the actual usage of these websites at the field level may not always be for official purposes, there could be benefits from controlling and conserving such usage rather than blocking or generally limiting access to such sites. During the visit to Sub-office Dadaab, OIOS noted that the internet connection (30mbps) was saturated mainly due to YouTube use which prevented OIOS from accessing official United Nations websites.

29. In the absence of effective QoS or optimization tools, particularly in locations where the services are provided by ISPs, there is risk that the performance of corporate applications would be degraded.

(4) The UNHCR Division of Information Systems and Telecommunications should implement the processes required to ensure that the necessary bandwidth is allocated to meet the professional and personal requirements of users in locations where the quality of service mechanism is not feasible or available.

UNHCR accepted recommendation 4 and stated that the DIST would document the processes in the proposed revision to the "Connectivity Strategy and Capacity Management" guidance and would implement them in 2019 if sufficient budget was allocated. Recommendation 4 remains open pending

implementation of processes to ensure that the necessary bandwidth is allocated to meet the professional and personal requirements of users in locations where the quality of service mechanism is not feasible or available.

C. Bandwidth for staff welfare purposes

DIST and DHRM needed to coordinate to ensure connectivity at staff accommodation locations

30. Pursuant to the Administrative Instruction on UNHCR-Provided Accommodation in the Field (UNHCR/AI/2014/11), UNHCR is committed to improving the working and living conditions of staff serving in isolated and hardship locations. The instruction sets the minimum standards for staff accommodation which includes the provision of adequate internet connectivity.

31. From the records provided by DHRM, OIOS observed that UNHCR staff accommodations and guesthouses were spread out in 122 locations worldwide. However, DHRM had no reliable information on the quality of internet connectivity or the type of link or details of the service providers at these locations, while DIST had connectivity details for staff accommodation only for 12 locations. No explanation was available for the significant discrepancy in the numbers between the two divisions. Furthermore, the network monitoring tools implemented by DIST did not specifically monitor the internet traffic related to staff accommodation. Consequently, OIOS was not able to assess the adequacy of bandwidth for staff welfare purposes in UNHCR-provided accommodations. Although the responsibility for providing connectivity in staff accommodation was assigned to DIST, there was a need for better coordination with DHRM for the establishment and smooth functioning of internet links in staff accommodations.

(5) The UNHCR Division of Information Systems and Telecommunications, in coordination with the Division of Human Resources Management, should establish a mechanism, based on the requirements, for the provision and monitoring of internet connectivity at staff accommodations.

UNHCR accepted recommendation 5 and stated that the Global Staff Accommodation Unit of DHRM would coordinate with field offices and DIST on the internet requirements utilizing the existing Administrative Instruction on UNHCR-Provided Accommodation in the Field (UNHCR/AI/2014/11). DIST would also include the identified sites into the scope of the implementation of recommendations 1 and 2. Recommendation 5 remains open pending receipt of evidence confirming the establishment of a mechanism for the provision and monitoring of internet services at staff accommodations.

IV. ACKNOWLEDGEMENT

32. OIOS wishes to express its appreciation to the management and staff of UNHCR for the assistance and cooperation extended to the auditors during this assignment.

(*Signed*) Eleanor T. Burns
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ANNEX I

STATUS OF AUDIT RECOMMENDATIONS

Audit of arrangements to ensure the adequacy of the network bandwidth in the field operations of the Office of the United Nations High Commissioner for Refugees

Rec. no.	Recommendation	Critical[1]/ Important[2]	C/ O[3]	Actions needed to close recommendation	Implementation date[4]
1	The UNHCR Division of Information Systems and Telecommunications should review and update the Connectivity Strategy and Capacity Management guidance to better reflect bandwidth estimation and calculation, including consideration of the number of devices on the network.	Important	O	Submission to OIOS of the revised Connectivity Strategy and Capacity Management guidance to better reflect bandwidth estimation and calculation, including consideration of the number of devices on the network.	30 June 2018
2	The UNHCR Division of Information Systems and Telecommunications should: (a) lead the discussions on the need for it to be assigned a central role in capacity planning, procurement and management of field office bandwidth; (b) agree the resulting budgetary changes with the Regional Bureaux and the Division of Financial and Administrative Management; and (c) review and modify the 2015 Operational Guidelines for Budgeting and Procurement of ICT Equipment and Services to reflect these changes.	Important	O	Submission to OIOS of the relevant administrative instruction issued in agreement with DFAM and the Regional Bureaux and the revised operational guidelines confirming DIST's lead role in capacity planning, procurement and management of field office bandwidth.	31 March 2019
3	The UNHCR Division of Information Systems and Telecommunications should ensure appropriate monitoring of bandwidth use across all UNHCR sites.	Important	O	Submission to OIOS of evidence of the implementation of appropriate actions for monitoring of bandwidth use across all UNHCR sites and the revised Connectivity Strategy and Capacity Management guidance that reflects the exclusion criteria for bandwidth monitoring at field offices.	31 March 2019
4	The UNHCR Division of Information Systems and Telecommunications should implement the	Important	O	Submission to OIOS of evidence of implementation of processes to ensure that the	30 June 2019

[1] Critical recommendations address critical and/or pervasive deficiencies in governance, risk management or control processes, such that reasonable assurance cannot be provided with regard to the achievement of control and/or business objectives under review.
[2] Important recommendations address important (but not critical or pervasive) deficiencies in governance, risk management or control processes, such that reasonable assurance may be at risk regarding the achievement of control and/or business objectives under review.
[3] C = closed, O = open
[4] Date provided by UNHCR

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Rec. no.	Recommendation	Critical[1]/ Important[2]	C/ O[3]	Actions needed to close recommendation	Implementation date[4]
	processes required to ensure that the necessary bandwidth is allocated to meet the professional and personal requirements of users in locations where the quality of service mechanism is not feasible or available.			necessary bandwidth is allocated to meet the professional and personal requirements of users in locations where the quality of service mechanism is not feasible or available.	
5	The UNHCR Division of Information Systems and Telecommunications, in coordination with the Division of Human Resources Management, should establish a mechanism, based on the requirements, for the provision and monitoring of internet connectivity at staff accommodations**.**	Important	O	Submission to OIOS of evidence confirming the establishment of a mechanism for the provision and monitoring of internet services at staff accommodations.	31 March 2019

APPENDIX I

Management Response

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Management Response

Audit of arrangements to ensure the adequacy of the network bandwidth in the field operations of the Office of the United Nations High Commissioner for Refugees

Rec. no.	Recommendation	Critical[5]/ Important[6]	Accepted? (Yes/No)	Title of responsible individual	Implementation date	Client comments
1	The UNHCR Division of Information Systems and Telecommunications should review and update the Connectivity Strategy and Capacity Management guidance to better reflect bandwidth estimation and calculation, including consideration of the number of devices on the network.	Important	Yes	Deputy Director, ICT Operations	30 June 2018	DIST will review and update the *"Connectivity Strategy and Capacity Management"* guidance taking into account the recommendations of this audit, as well as the progressive deployment of new applications. DIST will also take into consideration the average number of devices per user, and will adjust the guidance accordingly.
2	The UNHCR Division of Information Systems and Telecommunications should: (a) lead the discussions on the need for it to be assigned a central role in capacity planning, procurement and management of field office bandwidth; (b) agree the resulting budgetary changes with the Regional Bureaux and the Division of Financial and Administrative Management; and (c) review and modify the 2015 Operational Guidelines for Budgeting and	Important	Yes	Deputy Director, ICT Customer Support Deputy Director, Head of DFAM / PBS	31 March 2019	DIST will work together with DFAM and the Regional Bureaux to identify the appropriate modalities to comply with this recommendation. The *"Operational Guidelines for Budgeting and Procurement of ICT Equipment and Services"* will then be reviewed accordingly.

[5] Critical recommendations address critical and/or pervasive deficiencies in governance, risk management or control processes, such that reasonable assurance cannot be provided with regard to the achievement of control and/or business objectives under review.

[6] Important recommendations address important (but not critical or pervasive) deficiencies in governance, risk management or control processes, such that reasonable assurance may be at risk regarding the achievement of control and/or business objectives under review.

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Rec. no.	Recommendation	Critical[5]/ Important[6]	Accepted? (Yes/No)	Title of responsible individual	Implementation date	Client comments
	Procurement of ICT Equipment and Services to reflect these changes.					
3	The UNHCR Division of Information Systems and Telecommunications should ensure appropriate monitoring of bandwidth use across all UNHCR sites.	Important	Yes	Deputy Director, ICT Operations	31 March 2019	DIST will need to extend its monitoring capacity to additional offices, beyond the 395 offices that are monitored today. This will require budget and local implementation of equipment and tools. As this is not realistic for all UNHCR field locations, DIST will ensure that the criteria for exclusion will be defined in the revised *"Connectivity Strategy and Capacity Management"* guidance.
4	The UNHCR Division of Information Systems and Telecommunications should implement the processes required to ensure that the necessary bandwidth is allocated to meet the professional and personal requirements of users in locations where the quality of service mechanism is not feasible or available.	Important	Yes	Deputy Director, ICT Operations	30 June 2019	DIST will document the processes in the *"Connectivity Strategy and Capacity Management"* guidance that will be issued by Q2 2018. DIST will implement the processes by Q2 2019 if sufficient budget is allocated.
5	The UNHCR Division of Information Systems and Telecommunications, in coordination with the Division of Human Resources Management, should establish a mechanism, based on the	Important	Yes	Deputy Director, ICT Operations DHRM / Global Staff	31 March 2019	DHRM GSAU will coordinate with Field Offices and DIST on the internet requirement utilizing the existing UNHCR/AI/2014/11 (and its revision in 2018) Minimum Standards for UNHCR Provided Accommodation Check List (Annex 4) which Field Offices are expected to complete once a year.

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Management Response

Audit of arrangements to ensure the adequacy of the network bandwidth in the field operations of the Office of the United Nations High Commissioner for Refugees

Rec. no.	Recommendation	Critical[5]/ Important[6]	Accepted? (Yes/No)	Title of responsible individual	Implementation date	Client comments
	requirements, for the provision and monitoring of internet connectivity at staff accommodations**.**			Accommodation Manager		DIST will include the identified sites into the scope of the implementation of recommendations 1 and 2.