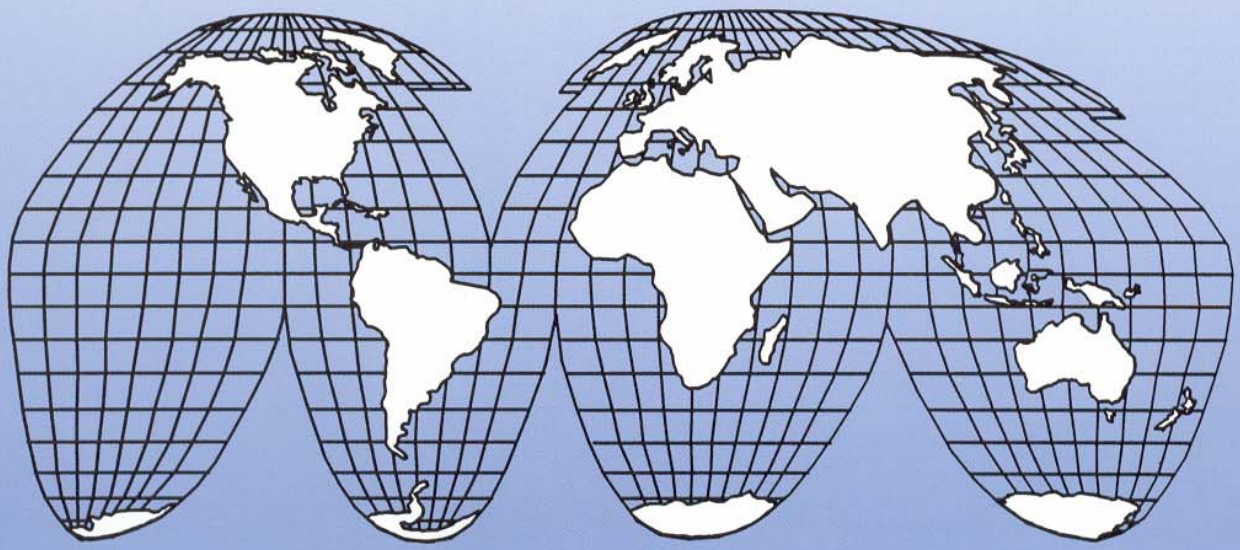
USAID

OFFICE OF INSPECTOR GENERAL

Audit of USAID's Information Technology Infrastructure

Audit Report No. A-000-05-006-P

February 22, 2005



WASHINGTON, D.C.

February 22, 2005

MEMORANDUM

FOR: Acting Chief Information Officer, John Streufert
Chief Financial Officer, Lisa Fiely

FROM: IG/A/ITSA, Melinda G. Dempsey /s/

SUBJECT: Audit of USAID's Information Technology Infrastructure (Report No. A-000-05-006-P)

This memorandum transmits our final report on the subject audit. In finalizing the report, we considered your comments on our draft report and have included them in their entirety as Appendix II.

The report contains nine recommendations for corrective action. Based on your comments to our draft report, we consider that management decisions have been reached for Recommendation Nos. 1, 3, 4, 7, 8 and 9. For these recommendations, please notify the Bureau for Management's Office of Management Planning and Innovation when final action is completed.

Based on our evaluation of your comments and all supporting documentation provided, we consider that final action has occurred on Recommendation Nos. 2, 5, and 6.

I want to express my sincere appreciation for the cooperation and courtesies extended to my staff during this audit.

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Summary of Results

The Information Technology and Special Audits Division of the Office of Inspector General in Washington, D.C. has completed an audit to determine whether the U.S. Agency for International Development (USAID) has a capable information technology (IT) infrastructure that supplies reliable[1] interconnectivity between USAID/Washington and overseas missions to effectively[2] support USAID's new core financial system known as Phoenix.[3] This audit was a follow-on to the IT telecommunications related concerns identified in the Phoenix Overseas Deployment Pilot Observation at Egypt memorandum report.[4] (See page 7)

The audit concluded that USAID has a capable IT infrastructure that supplies reliable interconnectivity between USAID/Washington and most of USAID's overseas missions in the Latin America and Caribbean (LAC) and Europe and Eurasia (E&E) regions to effectively support Phoenix. However, interconnectivity performance falls short at USAID's missions in the Asia and Near East (ANE) and especially Africa (AFR) regions where telecommunications infrastructure is inherently limited in lesser-developed or remote areas. Additionally, USAID's aging IT infrastructure is a contributing factor to slow network and application performance. (See page 8)

In conducting the audit, we also noted the following related issues: (1) USAID has not documented its Information Resources Management Strategic Plan since May 2000. (See page 16); (2) USAID's Bureau of Management, Office of Information Resources Management (M/IRM) does not have formal standards and processes in place to measure performance of USAID's worldwide area network. (See page 18); (3) USAID does not have formal published standards or goals to measure the performance of transaction response times in Phoenix for either USAID/Washington or the missions. (See page 21); and (4) the Phoenix Overseas Deployment (POD) project's technical contingency plan for slow network connectivity or network disruptions is still under development and there is no business contingency plan in place. (See page 22)

In their response to our draft report, USAID's Chief Information Officer and Chief Financial Officer agreed with all nine recommendations. Based on our evaluation, management decisions have been reached for Recommendation Nos. 1, 3, 4, 7, 8 and 9 and final action has occurred on Recommendation Nos. 2, 5, and 6. (See page 24). Management comments are included in their entirety in Appendix II.

[1] Reliable: consistent end-to-end network and hardware computing with minimal down time or disruptions.

[2] Effectively: actual computer processing (i.e., speed, accuracy) is acceptable, reasonable, and consistent with industry standards.

[3] At the time of the audit, the Phoenix system was based on CGI-AMS Momentum Financials® version 3.7.4.

[4] USAID OIG Report No. A-000-05-001-S, issued on October 13, 2004.

Background

USAID depends on its worldwide area network (WAN) IT infrastructure to process, store, transfer, and share information in support of implementing development programs. USAID/Washington and all USAID overseas missions communicate with each other over the WAN, which is comprised of three network paths:

1. **Diplomatic Telecommunications Service (DTS):** a network system of interconnected secure data and voice circuits supporting foreign affairs agency headquarters in Washington and U.S. diplomatic missions abroad. The DTS Program Office (DTSPO) is jointly administered by the Department of State and other foreign affairs agencies to manage the global DTS network. Per Congressional mandate, DTSPO must provide responsive, reliable, secure and cost-effective telecommunications service to the foreign affairs community.

2. **Very Small Aperture Terminal (VSAT):** a terrestrial station used in satellite communications of data, voice and video signals. Satellite technology is typically used where telecommunications infrastructure is inherently limited, such as in lesser-developed or remote areas. VSATs are used at missions where other network services do not meet USAID requirements and/or are not cost effective.

3. **Internet Service Provider (ISP)/Virtual Private Network (VPN):** a network that uses the Internet as the medium for transporting data. VPNs use encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted.

In September 1999, USAID acquired a new core financial system—CGI-American Management Systems' Momentum Financials® (Momentum)—a commercial off-the-shelf (COTS) product. Momentum was configured to support USAID requirements and renamed "Phoenix." In December 2000, Phoenix was rolled out to USAID/Washington. In 2004, Phoenix[5] was piloted and rolled out to USAID's accounting stations in Peru, Egypt, and Ghana and the Columbia and Nigeria client missions of Peru and Ghana, respectively.

[5] At the time of the audit, the Phoenix system was based on Momentum version 3.7.4, a client/server type application. USAID is planning to upgrade this software to Momentum version 6.x in June 2005. While enhancements are provided with version 6.x, the primary difference is the web-based browser environment. This upgrade will also enable integration with Momentum Acquisitions®.

In July 2004, the Office of Inspector General observed the Phoenix pilot deployment process conducted at USAID/Egypt. The observation raised concerns, among others, of slow system response times when processing transactions in Phoenix. The uncertainty of USAID's telecommunications infrastructure is a known risk associated with the Phoenix Overseas Deployment project. In the Phoenix Rollout Project Charter,[6] the technology assumptions and risks state that the technical and communications infrastructure may not support Phoenix system requirements. It was also reported in several Phoenix Deployment meetings that USAID is relying on old hardware that may be unreliable to provide interconnectivity between USAID/Washington and overseas missions.

In November 2004, the Phoenix Overseas Deployment project team updated the deployment schedule. The revised schedule accelerates the LAC deployment from April 2005 to February 2005 and will deploy Phoenix initially with Momentum version 3.7.4. Table 1 below shows the revised deployment schedule for all four regional bureaus:

Table 1 – Revised Phoenix Overseas Deployment Schedule

Regional Bureau	Original Schedule	Revised Schedule
Latin America and Caribbean (LAC)	April 2005	February 2005
Upgrade Pilots, USAID/Washington, and LAC to Momentum 6.x	March 2005	June 2005
Europe and Eurasia (E&E)	August 2005	July 2005
Asia and Near East (ANE)	December 2005	December 2005
Africa (AFR):		
North	June 2005	March 2006
South	June 2005	April 2006

Audit Objective

This audit was a follow-on to the IT telecommunications related concerns identified in the Phoenix Overseas Deployment Pilot Observation at Egypt memorandum report.[7] The audit was added to the Office of Inspector General's fiscal year 2005 audit plan to answer the following question:

> **Does USAID have a capable information technology infrastructure that supplies reliable[8] interconnectivity between USAID/Washington and overseas missions to effectively[9] support Phoenix?**

[6] Phoenix Rollout Project Charter, MST-PMO-004-CP-004-F00-IBM, dated 8/15/03.
[7] USAID OIG Report No. A-000-05-001-S, issued on October 13, 2004.
[8] Reliable: consistent end-to-end network and hardware computing with minimal down time or disruptions.
[9] Effectively: actual computer processing (i.e., speed, accuracy) is acceptable, reasonable, and consistent with industry standards.

Appendix I contains a discussion of the audit's scope and methodology.

Audit Findings

USAID has a capable IT infrastructure that supplies reliable interconnectivity between USAID/Washington and most of USAID's overseas missions in the LAC and E&E regions to effectively support Phoenix. However, interconnectivity performance falls short at USAID's missions in the ANE and especially AFR regions where telecommunications infrastructure is inherently limited in lesser-developed or remote areas. Additionally, USAID's aging IT infrastructure is a contributing factor to slow network and application performance.

Since 1999, security and telecommunications IT infrastructure has improved as a result of M/IRM's Wide Area Renovation Project. An analysis of USAID's interconnectivity between USAID/Washington and 45 designated overseas Phoenix missions[10] (including the 5 deployed pilot missions) indicates that 20 of 45 (44 percent) missions have the potential of achieving fast connectivity, when compared to industry trends under current "best case" network conditions. From a regional standpoint, LAC performed the best followed by E&E. On average, USAID's network was up and running 99.7 percent at all 45 missions during October 2004, even at missions with slow network speeds.

However, interconnectivity between USAID/Washington and the overseas missions in the ANE and AFR regions is the slowest among the 45 missions under current "best case" conditions. Usually, missions located in these areas only have satellite technology available, which runs slower than other network paths. When technology catches-up in the lesser-developed or remote areas, interconnectivity performance should likely improve, but this is difficult to predict. In the meantime, USAID could improve several areas of its IT infrastructure and reduce the risk of poor interconnectivity between USAID/Washington and overseas missions by: (1) fine-tuning and/or replacing, if feasible, existing IT infrastructure equipment, especially in lesser-developed or remote areas where network performance falls short, (2) updating the Five-Year Information Resources Management Strategic Plan, (3) developing and implementing standards and processes for measuring and reporting on network performance, (4) developing and implementing formal performance goals and processes for application transaction response times, and (5) establishing a viable Phoenix Overseas Deployment project business contingency plan for slow network connectivity.

Optimally, these improvements would be most effective if implemented prior to deploying Phoenix to the missions worldwide, but at a minimum, USAID should work on these improvements before deploying Phoenix to the ANE and AFR regions. These areas are discussed in detail below.

[10] At the time of the audit, 45 overseas Mission Accounting Control System (MACS) and Controllers sites had been designated for Phoenix deployment.

USAID's Network Performance Falls Short in AFR and ANE Regions

Summary: Interconnectivity performance between USAID/Washington and overseas missions varies by region. When compared to current industry trends, network performance is considered slow in the ANE and AFR regions, but medium to fast in the LAC and E&E regions. USAID's missions located in lesser-developed or remote areas are faced with limited telecommunications infrastructure and inherent technical constraints. Additionally, USAID's aging IT infrastructure is a contributing factor to slow network and application performance. As a result, USAID's network performance is sometimes slow and unfavorably impacts on Phoenix[11] application performance.

Network Performance Benchmarks – According to industry guidelines, network performance can be analyzed using various measurement goals such as response time, capacity (bandwidth), utilization, throughput, etc. Response time,[12] measured in terms of latency,[13] is a performance goal that users care about the most and is the focus of the analysis in this report. The actual latency of a data packet on the network is a combination of the time taken to traverse the distance and the time taken to process the packet at each of the routers along the connection. Total network latency, calculated in milliseconds (ms), is called Round Trip Time (RTT).

According to an industry leader in networking, any goals regarding latency must take into account fundamental physics. Latency is relevant for all data transmission technologies, but especially for satellite links and long terrestrial cables. Geostation satellites are in orbit above the earth at a height of about 24,000 miles. This long distance leads to a latency of about 270ms for an intercontinental satellite hop. In the case of terrestrial cable connections, latency is about 1ms for every 120 miles. As for router latency, this refers to the latency accrued when bridges, switches, and routers forward data. The latency depends on the speed of the internal IT architecture equipment.

From a user's perspective, waiting a long time for a computer system to respond can be frustrating. For heavy transactional environments, long system response times significantly impact on worker productivity. Users recognize small changes in the expected response time. These experiences are relative to the baseline performance users have come to expect from the applications they use. If their

[11] At the time of the audit, the Phoenix system was based on Momentum version 3.7.4. USAID is planning to upgrade this software to Momentum version 6.x in June 2005. Performance data for the future Momentum version 6.x was not available during the audit, thus it was not analyzed.

[12] Response time is the amount of time between a request for a network service and a response to the request.

[13] Latency is generally the amount of time required for a data packet to traverse the network from source to destination and refers to a delay factor that will inherently impact any transaction which uses that component.

current experience differs significantly from their expectations, support calls and complaints increase dramatically.

Reputable IT research firms such as Gartner, CAIDA, and FineGround have conducted extensive studies on RTT and latency in a WAN and internet environment. Those studies on latency industry trends provide an industry benchmark for measuring USAID's network performance, as shown in Table 2 below.

Table 2 – Network Latency Industry Benchmark[14]

RTT (ms)	Performance Value
0-300	Optimal network speed: Best connectivity. Highest application performance and user productivity
301-599	Minimal acceptable network speed: Connectivity medium to slow. Relative application performance reduced approaching the upper limit
600+	Slow network speed: Poor connectivity and high latency. Application performance low and lost user productivity

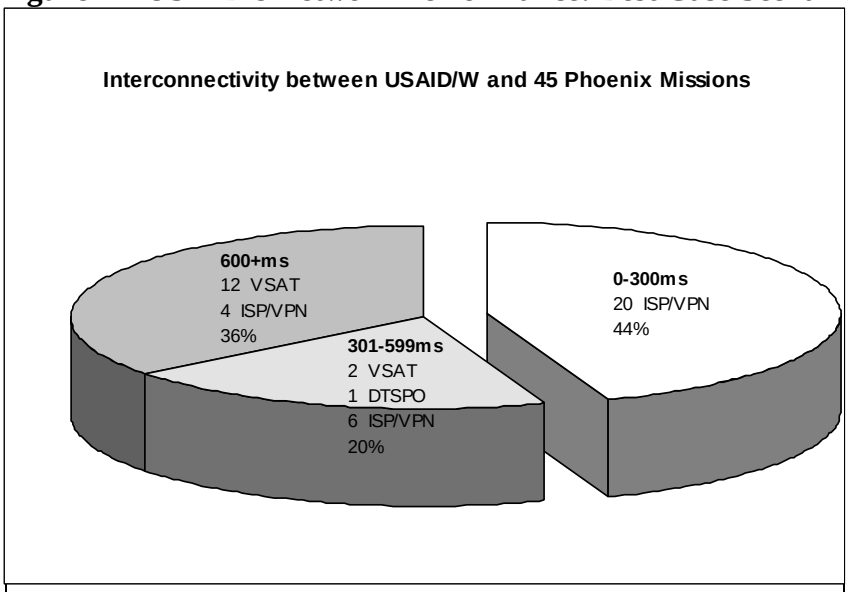
Analysis of USAID's Network Performance – Each of the 45 designated overseas Phoenix missions[15] (including the five pilot missions[16]) has a designated primary and secondary network path. Those paths are either DTSPO, VSAT, or ISP/VPN, depending on availability. Sorting USAID's network monitoring data from those missions by fastest available network path—regardless of actual configured primary path at each mission—showed that the ISP/VPN network path performed the best and provided the potentially lowest latency of the three network paths. As shown in Figure 1 below, 20 of 45 (44 percent) missions have the potential of achieving fast connectivity of less than 300ms. However at the same time, 16 of 45 (36 percent) missions have the potential of only achieving connectivity of 600ms or more under current "best case" conditions, which is considered slow according to industry trends.

[14] The data used in this table was obtained from Gartner, CAIDA, and FineGround and was not audited.

[15] At the time of the audit, 45 overseas Mission Accounting Control System (MACS) and Controllers sites had been designated for Phoenix deployment.

[16] In 2004, Phoenix was piloted and rolled out to Peru, Egypt, and Ghana accounting stations and the Columbia and Nigeria client missions of Peru and Ghana, respectively.

Figure 1 – USAID's Network Performance: Best Case Scenario[17]



0-300ms: Optimal network speed: Best connectivity. Highest application performance and user productivity

301-599ms: Minimal acceptable network speed: Connectivity medium to slow. Relative application performance reduced approaching the upper limit

600+ms: Slow network speed: Poor connectivity and high latency. Application performance low and lost user productivity

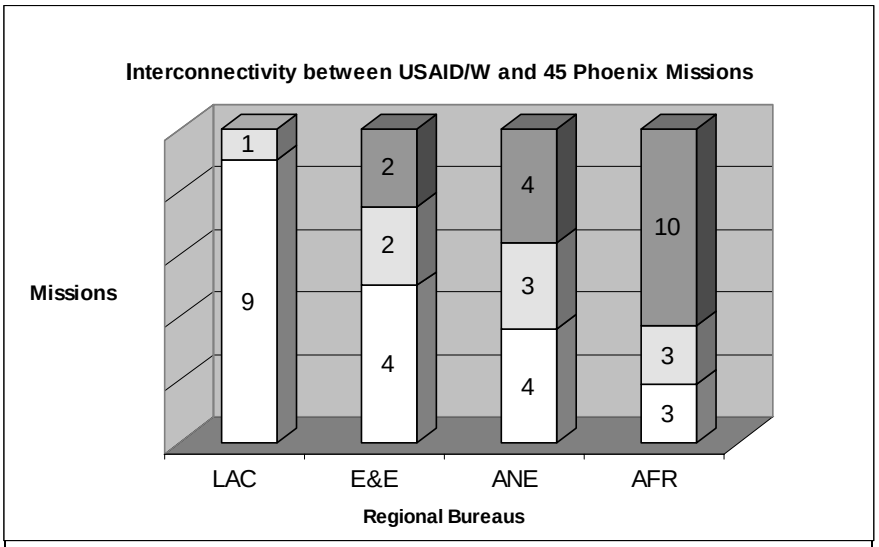
According to USAID officials, ISP/VPN is becoming increasingly popular with missions because of improved high speed service availability compared to DTSPO and VSAT. However, security and reliability of ISPs in certain lesser-developed or remote areas, such as in AFR and ANE are a concern. Therefore, speed is not always the key factor when selecting a primary network path for a mission. M/IRM typically uses five factors when deciding on the primary network path for a mission: availability, speed, reliability, security, and cost. M/IRM officials said that the five factors must be balanced appropriately and these decisions are constantly reevaluated to achieve the best possible outcome.

Figure 2 below presents a view of connectivity performance by regional bureau. The analysis shows that missions in LAC and E&E regions perform the best, while missions in ANE and especially AFR regions have major performance challenges. In the LAC region, 9 of 10 (90 percent) missions have the potential of achieving fast connectivity performance of 300ms or less. Meanwhile, in the AFR region, 10

[17] The amounts presented in this graph were provided by M/IRM's Enterprise Network Monitoring Service (ENMS) and its process for compiling the amounts was audited. The network performance data is comprised of average daily RTT readings in September and October 2004 for DTSPO and VSAT. For ISP/VPN, the RTT readings are the averages of one sample day in October and one sample day in November 2004.

of 16 (63 percent) missions face slow connectivity of 600ms or more. For details of all 45 missions, please refer to Appendix III.

Figure 2 – USAID's Network Performance by Regional Bureau[18]



0-300ms: Optimal network speed: Best connectivity. Highest application performance and user productivity

301-599ms: Minimal acceptable network speed: Connectivity medium to slow. Relative application performance reduced approaching the upper limit

600+ms: Slow network speed: Poor connectivity and high latency. Application performance low and lost user productivity

The analysis of USAID's network performance by regional bureau is consistent with a recent United Nations study[19] that ranked 178 countries on Information and Communication Technology (ICT). Lower ranked ICT countries are primarily located in Sub-Saharan Africa and Near East. Countries in the lower ranked category are the poorest in the world with the lowest levels of communications infrastructure. Landlocked countries are at an even greater disadvantage since their international connectivity options are restricted to satellite.

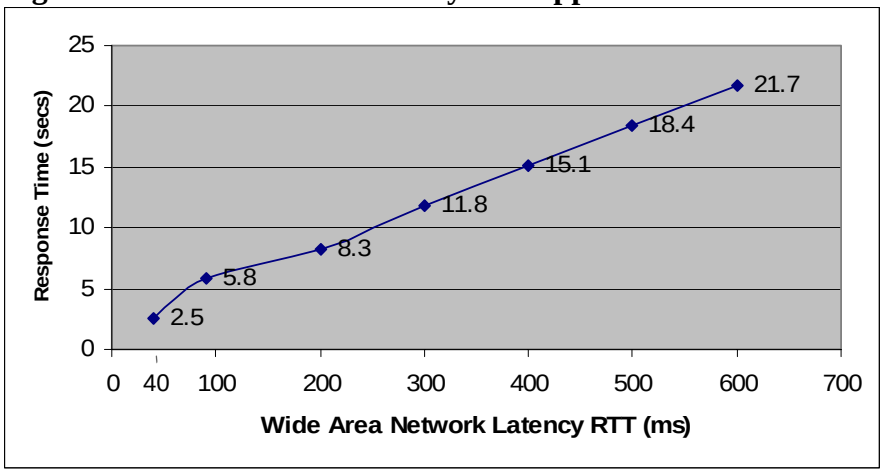
Impact of High Latency on Application Performance – An analysis of USAID's network indicates that high latency impacts on Phoenix[20] application performance.

[18] Ibid, Figure 1.
[19] The United Nation's International Telecommunication Union published the first global index to rank Information and Communication Technology of 178 countries on November 19, 2003.
[20] The analysis is based on the current Phoenix software—Momentum version 3.7.4. Performance data for the future Momentum version 6.x was not available during the audit, thus it was not analyzed.

Logfile[21] data that was collected for about three months at selected Phoenix pilot overseas missions shows that Phoenix pilot users experienced long wait-times for certain transactions. For example, USAID/Nigeria experienced some of the slowest times among the five pilot missions. The "verify" transaction times ranged from about 1 minute to over 3 minutes and users reported that the system had been slow, much slower than ever before. Phoenix occasionally froze or users were blocked out and they had to exit Phoenix through task manager. USAID/Ghana also experienced wait-times of over 2 minutes on certain transactions.

According to recent industry studies,[22] an average transaction response time range of 6 to 10 seconds is a reasonable "rule of thumb" benchmark for Enterprise Resource Planning type applications (similar to Phoenix), in consideration of various RTTs and network environments. Additionally, FineGround's research correlated the impact of high latency on application performance. Figure 3 below shows the correlation of application response times from a leading online banking site across a range of various network latencies.

Figure 3 – Correlation of Latency and Application Performance[23]



As shown in Figure 3, application performance degrades rapidly with latency. For example, response time with 300ms of latency is almost 5 times more than response time with 40ms of latency.

In April 2004, the Program Management Office identified 33 risks for the Phoenix Overseas Deployment project. One of the risks identified is related to poor telecommunications and interconnectivity between USAID/Washington and the

[21] Logfile data comes from the monitoring feature in Momentum 3.7.4 (Phoenix) for selected users at the 5 pilot missions and USAID/Washington to collect actual transaction response time data from September through November 2004.
[22] Recent industry studies published by FineGround and Publications & Communications, Inc.
[23] The data presented in this graph was obtained from FineGround and was not audited. The Office of Inspector General resident statistician used regression analysis to estimate application response times for RTT between 300 and 600ms.

overseas missions. The implementation of applet[24] technology was identified as a technical risk mitigation strategy to ensure that a working interface to Phoenix is available in all sites, in cases where available telecommunications cannot support the Phoenix application. The applet technology (eFIX) that was designed as a Phoenix Overseas Deployment technical risk mitigation strategy has not yet achieved consensus that the types of transactions eFIX can process are sufficient to be a practical solution for USAID missions likely to experience latency problems. This is described further on page 22 of this report.

According to Gartner, greater reliance on new, inefficient protocols,[25] combined with increasing global requirements, will result in applications that will not meet even minimum user expectations, resulting in lost user productivity. Gartner's research suggests that 90 percent of networks that do not address latency issues will not meet business-critical application service levels through 2007 (0.8 probability). Distance and the speed of light are two contributors to latency that cannot be optimized; therefore, Gartner recommends that network managers look at alternative fine-tuning options for dealing with these limitations.

Impact of Aging IT Infrastructure – USAID's aging IT infrastructure is a contributing factor to slow network and application performance. Many IT equipment items are near, have reached, or exceeded their serviceable lifespan. Although M/IRM's Wide Area Renovation Project that was initiated in 1999 had significantly improved security and telecommunications IT infrastructure at 84 missions, some equipment items are considered already obsolete and no longer supported by the manufacturer, according to M/IRM documents. As a result of USAID's lack of operating expense funds and lack of funding for technical upgrades for the past several years, much of the IT infrastructure is older than industry standard life cycles would typically allow. Because of the aging of the infrastructure, maintenance is more difficult and expensive, failures are more frequent, and securing the infrastructure components is more difficult.

In September 2004, M/IRM published its Technology Refresh Plan (the plan) to present recommendations for the procurement and implementation of new technology components and processes for USAID. The plan focused on funding for planning, acquisition, and deployment of worldwide IT infrastructure technical upgrades for many categories of equipment to bring USAID up to state-of-the-art equipment standards in both headquarters and missions. This plan states that it will improve the functioning of USAID's IT systems in support of efficiency of USAID staff and also in support of collaboration with the Department of State in converging the two organizations' networks. The plan expands on short and long-

[24] An applet is a program written in the Java programming language that can be included in an HTML page, much in the same way an image is included.

[25] A protocol is an agreed-upon format for transmitting data between two devices. There are a variety of standard protocols from which programmers can choose. Each has particular advantages and disadvantages; for example, some are simpler than others, some are more reliable, and some are faster.

term initiatives focusing on those that are important to initiate over the next 12 to 24 month period. The plan outlines and prioritizes 15 areas where IT infrastructure should be upgraded and highlights the risks of not upgrading and that "the greater danger lies in waiting and doing nothing."

Further, a recent study on USAID's IT infrastructure[26] reported that USAID's current process of deferring spending and the postponement of the implementation of a sound and integrated information technology architecture are in direct contradiction to the mandates of the Information Technology Management Reform Act and the Clinger-Cohen Act. The study warns if USAID continues in the current mode of only replacing systems when they cease to function or when absolutely necessary to maintain required functionality, the continual aging and diversity will lead to catastrophic collapses and/or sky rocketing support costs and service interruptions over the next 12 to 36 months, jeopardizing the key USAID mission. The study suggests, in part, that USAID establish a plan to systematically upgrade critical infrastructure to a common, industry-standard platform, maximizing the potential to leverage other compatible government and private sector initiatives, such as those under way at the Department of State and in private technology providers.

In sum, USAID's IT infrastructure in missions located in lesser-developed or remote areas are faced with limited telecommunications infrastructure and inherent technical constraints. Additionally, USAID's aging IT infrastructure is a contributing factor to slow network and application performance. Consequently, USAID's network performance falls below industry benchmarks in these areas and our analysis shows that slow network speed unfavorably impacts on application performance, such as with Phoenix.

Recommendation No. 1: We recommend that USAID's Director, Office of Information Resources Management, implement a process to continuously monitor and improve network protocol settings and fine-tune and/or replace, if feasible, existing information technology infrastructure equipment in support of the Phoenix Overseas Deployment project.

Recommendation No. 2: We recommend that USAID's Director, Office of Information Resources Management, implement a process to periodically identify alternate sources of telecommunications service providers and emerging technologies, especially in lesser-developed or remote areas where telecommunications infrastructure is limited, such as in the Africa and Asia and Near East regions to help improve

[26] Forrester Research, Inc., "Analysis and Recommendations for USAID Infrastructure Refresh" January 20, 2005.

USAID's information technology infrastructure performance in support of the Phoenix Overseas Deployment project.

Information Resources Management Strategic Plan Outdated

Summary: USAID has not updated its five-year Information Resources Management (IRM) Strategic Plan since May 2000. USAID's Automated Directives System (ADS) 542.5.2 requires that the IRM Strategic Plan be updated annually. The primary reasons for deferring the IRM Strategic Plan were related to the unclear degree of joint IT initiatives between the Department of State and USAID and reorganization disruptions in the Bureau of Management. Nevertheless, without an updated IRM Strategic Plan, it will be difficult for USAID to focus on network connectivity performance challenges in support of the Phoenix Overseas Deployment project, as well as align its IT infrastructure to meet the joint Department of State/USAID's IT goals through effective information management.

Office of Management and Budget (OMB) Circular No. A-130, "Management of Federal Information Resources," establishes policy for the management of Federal information resources and includes procedural and analytic guidelines for implementing specific aspects of these policies. The Circular states that in the capital planning and investment control process, there are two separate and distinct plans that address IRM and IT planning requirements for the agency—the IRM Strategic Plan and IT Capital Plan. The IRM Strategic Plan is strategic in nature and addresses all information resources management of the agency. Agencies must develop and maintain the agency IRM Strategic Plan as required by 44 U.S.C. 3506 (b) (2). IRM Strategic Plans should support the agency Strategic Plan required in OMB Circular A-11, provide a description of how information resources management activities help accomplish agency missions, and ensure that IRM decisions are integrated with organizational planning, budget, procurement, financial management, human resources management, and program decisions. The IT Capital Plan is operational in nature, supports the goals and missions identified in the IRM Strategic Plan, is a living document, and must be updated twice yearly.

Further, ADS 542, "Planning and Budgeting for IT Resources," provides a framework and the essential procedures for planning and budgeting for information management and IT resources to carry out the Agency's mission, goals, and objectives. Section 542.5.2 requires that an Agency-wide IRM Strategic Plan for the creation, collection, processing, transmission, use, storage, dissemination, and disposition of information be developed. It also states that the IRM strategic planning process shall support the Agency's current and future mission, program needs, and include participation from the Agency's bureaus, independent offices, and missions. Additionally, the ADS states that the IRM Strategic Plan shall serve as the cornerstone for formulating the Agency-wide IRM

budget submission to OMB. Section E542.5.2 requires, in part, that the IRM Strategic Plan be updated annually.

The purpose of the five-year IRM Strategic Plan is to provide a strategic plan based on identified needs and priorities, and recognize the challenges USAID will face in the next five years. Although the strategic plan that was published in 2000 has not been recently updated, it does require USAID to have an effective IT infrastructure, which is one of the named strategic objectives.

According to USAID officials, updated formulation of the IRM Strategic Plan will not be finished until around January 2005 because several on-going studies that would serve as the foundation of the IRM Strategic Plan would not be ready until then. The first draft IRM Strategic Plan is expected to be issued by the end of March 2005. The reasons for postponing the IRM Strategic Plan were: (1) the FY 2004-2009 Department of State and USAID Strategic Plan discussed exploring potential joint initiatives, including joint IT initiatives, but the degree of "jointness" in IT initiatives was not made clear by senior management in both agencies and (2) a very slow reorganization of the Bureau of Management, which took nearly two years to complete and, as such, was somewhat disruptive.

In April 2004, the Department of State issued its IT Strategic Plan Fiscal Years 2006-2010 Goals Paper. The Goals Paper incorporates the FY 2004-2009 Department of State and USAID Strategic Plan (Joint Strategic Plan) and provides a high-level blueprint for using the Department's modern IT infrastructure to deliver knowledge resources and IT services to State's diplomatic practitioners overseas and in the United States. The Joint Strategic Plan, which articulates the vision for integrating management structures between the organizations, explains that the Department of State and USAID will:

- Coordinate IT planning and common use of architecture and infrastructure. The Department of State and USAID will develop and implement a joint IT Strategic Plan to support common policy objectives.

- Develop and implement a joint Enterprise Architecture to guide both organizations' future IT investments.

- Work together to strengthen our IT Capital Planning process and produce consolidated OMB business cases and Exhibit 300 submissions.

- Develop a joint security architecture and a uniform and unified certification and accreditation process.

Without an updated IRM Strategic Plan, it will be difficult for USAID to focus on network connectivity performance challenges in support of the Phoenix Overseas Deployment project, as well as align its IT infrastructure to meet the joint Department of State/USAID's IT goals through effective information management.

Recommendation No. 3: We recommend that USAID's Chief Information Officer update USAID's Information Resources Management Strategic Plan to address the Agency's information technology requirements, priorities, and infrastructure challenges over the next five years and information technology goals articulated in the State Department's Information Technology Strategic Plan, Fiscal Years 2006-2010, Goals Paper (which is based on the 2004-2009 Department of State and USAID Strategic Plan).

Recommendation No. 4: We recommend that USAID's Chief Information Officer develop and implement a process to annually update USAID's Information Resources Management Strategic Plan.

Network Performance Standards and Processes Needed

Summary: M/IRM does not have formal standards and processes in place to measure performance of USAID's worldwide area network. Although M/IRM monitors the status of network connectivity on a daily basis for early-warning and diagnostic purposes, it does not have a process in place to measure network performance against established standards such as network Round Trip Time. Further, M/IRM does not separately monitor the ISP/VPN network path, which is becoming increasingly popular with missions because of improved high speed service availability compared to DTSPO and VSAT. ADS Section 549.3 states, in part, that M/IRM is responsible for monitoring network activities, documenting and logging connectivity, and measuring performance. Because of funding limitations and M/IRM not having established formal standards and processes for measuring performance of USAID's worldwide area network, it is difficult for M/IRM to fulfill its responsibility of providing a reliable, consistent, and cost-effective telecommunications network for USAID/Washington and all overseas locations worldwide in support of the Phoenix Overseas Deployment project.

ADS 549, "Telecommunications Management," provides the framework and essential procedures for management and use of USAID's full range of telecommunications services. According to Section 549.3, a Network Operations and Management Group within M/IRM is responsible for monitoring network activities, documenting and logging connectivity, measuring performance, taking

corrective action to maintain operational status, recommending and implementing network enhancements (in cooperation with M/IRM, Information Policy and Administration Division) and developing contingency plans. Further, Section 549.5.4k states that M/IRM shall provide the tools for IT Specialists to perform basic utilization reporting for their platforms and conduct periodic reviews on disk utilization, line activity, concentrator workload, server performance, and evaluate new maintenance releases for the operating system software.

In early 2000, M/IRM implemented a system performance monitoring tool (Concord's eHealth) to collect availability and performance data from selected critical systems such as Phoenix and Database servers. According to USAID officials, the eHealth tool provides a full, accurate picture about key system performance metrics—including CPU, memory, disk, availability, and line utilization—in an easy-to-understand, consistent format, regardless of the data source. It also identifies systems and applications with performance problems and provides a historical record of performance trends.

About two years ago, M/IRM initiated monitoring of USAID's network interconnectivity between USAID/Washington and the overseas missions. To establish a network monitoring gauge, M/IRM collected data for several weeks, analyzed it and determined that an appropriate high-end alert for network latency was 3 seconds, which was based on how the network was performing at that time. Using this gauge, M/IRM developed a network monitoring model to measure the network status in USAID/Washington and the overseas missions, as shown in Table 3 below.

Table 3 – Network Monitoring Model

Color Code	Network Latency
1. Green	<= 1 second
2. Blue	>1 second <= 3 seconds
3. Violet	> 3 seconds

Recognizing the need to monitor system performance at the Phoenix pilot missions in Egypt, Ghana, and Peru, M/IRM implemented Concord's Business Service Console (BSC) in July 2004. Throughout the day, monitoring of activities and status of applications (Phoenix, Crystal Enterprise), systems (Phoenix Servers), or networks (DTSPO, ISP/VPN, and VSAT) can be done with the BSC tool. The BSC tool can drill down to obtain details about the problem and determine the cause. Using this information, M/IRM can determine how efficiently applications and systems are running, whether critical resources are available, and what capacity planning initiatives make sense. However, due to funding limitations, M/IRM could only implement the BSC tool at the first three Phoenix pilot missions.

Although M/IRM has implemented Concord's monitoring tools on a limited basis and actively monitors the status of USAID's network on a daily basis for early-warning and diagnostic purposes and also, it does not have a process in place to measure network performance against established formal standards such as network Round Trip Time. According to M/IRM officials, the current network monitoring model (Table 3) was not intended to be a standard for measuring USAID's network performance.

Further, M/IRM does not separately monitor or report on the ISP/VPN network path as it does with DTSPO and VSAT. As a result, regular statistical and monitoring reports are not available for ISP/VPN as they are for the other network paths. Reporting for ISP/VPN is done on an ad hoc basis when requested. When M/IRM initiated network monitoring, it did not have a viable automated method to determine the network path (i.e., DTSPO, VSAT, and ISP/VPN) being used by a particular mission at a particular time and M/IRM could not correlate this data back to make separate polling routines for each network path, which could have different response time categories. However, according to M/IRM officials, this capability is now available.

We also noted that M/IRM has not updated its network monitoring model to match today's network environment where network speeds are running in milliseconds. The current network monitoring model categorizes network speeds in seconds rather than in milliseconds. The time categories that are currently being used to monitor the network were based on capabilities from approximately two years ago when M/IRM first started monitoring USAID's WAN.

Without established goals, updated standards, and processes for measuring USAID's network performance, it is difficult for M/IRM to fulfill its responsibility of providing a reliable, consistent, and cost-effective telecommunications network for USAID/Washington and all overseas locations worldwide in support of the Phoenix Overseas Deployment project.

Recommendation No. 5: We recommend that USAID's Director, Office of Information Resources Management, develop and implement goals, standards, and processes that are consistent with industry best practices for measuring and reporting on USAID's worldwide area network performance, such as expanding the use of performance monitoring tools agency wide.

Recommendation No. 6: We recommend that USAID's Director, Office of Information Resources Management, implement a process to actively monitor and prepare performance reports on the Internet Service Provider/Virtual Private Network path.

Phoenix Application Performance Goals Needed

Summary: USAID does not have formal published standards or goals to measure the performance of transaction response times in Phoenix for either USAID/Washington or the missions. According to the Joint Financial Management Improvement Program's (JFMIP)[27] testing guidelines for commercial off-the-shelf (COTS) software, agencies need to assess the COTS computing performance in the agency's system environment for response time and transaction throughput capacity, especially when an agency has large volumes of transaction data. According to USAID officials, it would be difficult to apply a single standard or goal across all missions because the missions vary in size and telecommunications capability. Nonetheless, transaction response time is a thermometer of usability for users. Without formal goals and standards for measuring transaction response time in Phoenix, it is difficult for USAID to improve application performance and increase user productivity.

According to JFMIP's "Qualification Test Process" guidelines for COTS software, agencies need to assess the COTS computing performance in the agency's system environment for response time and transaction throughput capacity, especially when an agency has large volumes of transaction data. Further, OMB Circular No. A-130, "Management of Federal Information Resources," states that an agency must institute performance measures and management processes that monitor actual performance compared to expected results.

USAID's Phoenix Roll-out Technical Team (Phoenix Team) conducted extensive testing and measured transaction response times at the five Phoenix pilot missions using USAID/Washington as the baseline. However, the test results were not measured against published Agency standards or goals. Instead, the Phoenix Team used the assumption that USAID/Washington's performance is generally recognized as an acceptable benchmark. According to USAID officials, it would be difficult to apply a single standard or goal across all missions because the missions vary in size and telecommunications capability. Therefore, USAID did not quantify its "acceptable transaction response times" in Phoenix.

Although applying a single standard or goal across all missions would be problematic, establishing goals by region or some other reasonable means would be beneficial. Transaction response time is a thermometer of usability for users. Users perceive the data processing experience in terms of how quickly they are able to get the screen to update. Poor application performance harms staff

[27] Effective December 1, 2004, the Principals of the JFMIP voted to realign JFMIP's responsibilities for financial management policy and oversight. Under the new structure, the JFMIP Program Management Office, which certifies financial management software, will report to a new Chief Financial Officers Council committee to be chaired by the Chief of OMB's Office of Federal Financial Management, Federal Financial Systems Branch.

productivity and is a major problem for organizations. Users waste time and get frustrated waiting for applications to respond. Where performance is particularly poor, they will avoid using an application altogether, often reverting to manual processes to get the job done. Performance of networked applications depends on complex interactions among applications, servers, and networks. Organizations need a detailed, quantitative understanding of these interactions to efficiently and cost-effectively troubleshoot and deploy applications. Without formal goals and standards for measuring transaction response time in Phoenix, it is difficult for USAID to improve application performance and increase user productivity.

Recommendation No. 7: We recommend that USAID's Chief Financial Officer, in collaboration with the Chief Information Officer and the Director, Office of Information Resources Management, develop and implement formal performance goals for transaction response times in Phoenix in all worldwide locations.

Recommendation No. 8: We recommend that USAID's Chief Financial Officer, in collaboration with the Chief Information Officer and the Director, Office of Information Resources Management, implement a process to actively monitor transaction response times in Phoenix in all worldwide locations.

Phoenix Project Needs Contingency Plan for Slow Network Connectivity

Summary: The Phoenix Overseas Deployment (POD) project's technical contingency plan for slow network connectivity or network disruptions is still under development and there is no business contingency plan in place. Appendix III of OMB Circular No. A-130 requires that application security plans include, in part, contingency planning to establish and periodically test the capability to perform the agency function supported by the application in the event of failure of its automated support. The applet technology (eFIX)—in its present form—represents a POD technical risk mitigation strategy; however because the types of transactions that eFIX can process is limited, eFIX is not a comprehensive business contingency plan. Additionally, eFIX will not be ready in time for the Phoenix deployment to LAC in February 2005. Without a viable business contingency plan, USAID is exposed to the risk of slow network connectivity and its negative impact on Phoenix application performance.

Appendix III of OMB Circular No. A-130 establishes a minimum set of controls to be included in Federal automated information security programs; assigns Federal agency responsibilities for the security of automated information; and links agency automated information security programs and agency management control systems

established in accordance with OMB Circular No. A-123. For contingency planning, the Appendix states that managers should plan for how they will perform their mission and/or recover from the loss of existing application support, whether the loss is due to the inability of the application to function or a general support system failure.

In April 2004, the Program Management Office identified 33 risks for the POD project. One of the risks identified is related to poor telecommunications and interconnectivity between USAID/Washington and the overseas missions. The implementation of the applet technology was identified as a technical risk mitigation strategy to ensure that a working interface to Phoenix is available in all sites, in cases where available telecommunications cannot support the Phoenix application. Further, having applet technology as an option (where telecommunications is inadequate) will help ensure that USAID can achieve the goal of a fully integrated core accounting system.

With the assistance of a contractor, M/IRM initiated the development of an applet solution known as eFIX[28] for Phoenix missions with telecommunications environments characterized by high latency and low reliability links. However, the types of transactions that eFIX can process is limited to only the most frequently-used transactions. Additionally, USAID officials have not yet achieved consensus that the types of transactions eFIX can process are sufficient to be a practical solution for USAID missions likely to experience latency problems. As a result, eFIX does not represent a full business solution for USAID, especially in overseas missions with large volumes of transactions. Further, eFIX is scheduled for testing in March 2005 and it will not be ready in time to support the Phoenix (Momentum 3.7.4) rollout to LAC in February 2005.

As part of contingency planning, some USAID officials have discussed the concept of "regionalizing" Phoenix in areas with network connectivity performance challenges, such as in the AFR region. Under this concept, Phoenix transaction processing at missions with very slow connectivity performance would be moved to a mission in the region with fast connectivity performance until such time when technology improves in the lesser-developed or remote areas. However, this concept has not been formalized as a business contingency plan.

Without a viable business contingency plan, USAID is exposed to the possible risk of slow network connectivity and its negative impact on Phoenix application performance.

[28] eFIX will allow users to work with a local website and database to create and queue selected transactions for submission to Phoenix. eFIX uses local Exchange and Outlook for transaction management. eFIX works with a "wizard-like" interface to step the user through the submission process.

Recommendation No. 9: We recommend that USAID's Chief Financial Officer, in coordination with the Chief Information Systems Security Officer, develop, test, and implement a viable Phoenix Overseas Deployment project business contingency plan for slow network connectivity.

Evaluation of Management Comments

USAID's Acting Chief Information Officer and Chief Financial Officer prepared a consolidated written response to our draft report. In their response, they agreed with all nine recommendations. We evaluated the comments, actions taken, and documents prepared by USAID and consider that management decisions have been reached for Recommendation Nos. 1, 3, 4, 7, 8 and 9 and consider that final action has been completed on Recommendation Nos. 2, 5, and 6.

The consolidated written response is included in its entirety in Appendix II of this report.

Scope and Methodology

Scope

The Information Technology and Special Audits Division of the Office of Inspector General in Washington, D.C. conducted this audit in accordance with generally accepted government auditing standards. The purpose of the audit was to determine whether USAID has a capable IT infrastructure that supplies reliable interconnectivity between USAID/Washington and overseas missions to effectively support Phoenix[29].

Fieldwork for this audit was conducted at USAID's headquarters in Washington, D.C., from October 27, 2004 to January 24, 2005. This audit was a follow-on to the IT telecommunications related concerns identified in the Phoenix Overseas Deployment Pilot Observation at Egypt memorandum report.[30]

Our audit focused on USAID's IT infrastructure and whether it supplies reliable interconnectivity between USAID/Washington and overseas missions to effectively support Phoenix. Accordingly, this audit assessed management controls over that process. In addition, the audit assessed the validity and reliability of M/IRM's computer-based data used in this report.

Methodology

To carryout the audit, we obtained an understanding of USAID's current IT infrastructure, which included reviewing IT systems documentation, such as baseline architecture reports. We examined documentation and records that addressed plans for upgrading USAID's IT infrastructure, such as USAID's strategic planning documents, joint Department of State and USAID Strategic Planning documents, technology refresh plans, and capital asset plans.

In answering the audit objective, we researched and identified current industry trends on WAN latency and performance, bandwidth, application response times, and hardware configurations to use as a benchmark to measure the performance of USAID's IT infrastructure. However, we focused our analysis only on network latency, response time, and interconnectivity between USAID/Washington and overseas missions in support of Phoenix. We assessed USAID's contingency plans for addressing slow application performance of Phoenix and poor interconnectivity between USAID/Washington and overseas missions. We also

[29] At the time of the audit, the Phoenix system was based on Momentum version 3.7.4, a client/server type application. USAID is planning to upgrade this software to Momentum version 6.x in June 2005. While enhancements are provided with version 6.x, the primary difference is the web-based browser environment. This upgrade will also enable integration with Momentum Acquisitions®.

[30] USAID Report No. A-000-05-001-S, issued on October 13, 2004.

examined USAID's compliance with applicable laws, regulations, policies, and procedures.

In addition, we interviewed responsible personnel in USAID's Bureau for Management, including officials in the Office of the Chief Information Officer, Office of Information Resources Management, Office of Financial Management, Office of the Chief Financial Officer, and the Program Management Office, as well as contractors.

A materiality threshold was not established for this audit given the nature of the audit objective, which involved assessing USAID's IT infrastructure and its interconnectivity between USAID/Washington and overseas missions.

Management Comments

February 14, 2005

MEMORANDUM

TO: IG/A/ITSA, Melinda G. Dempsey

FROM: Acting Chief Information Officer, John Streufert /s/
Chief Financial Officer, Lisa Fiely /s/

SUBJECT: Draft Audit Report of USAID's Information Technology Infrastructure, (Report No. A-000-05-00X-P)

Thank you for the opportunity to respond to the subject draft report. We appreciate your analysis on the IT infrastructure and your recommendations.

Draft Report Recommendations

Recommendation 1: We recommend that USAID's Director, Office of Information Resources Management, implement a process to continuously monitor and improve network protocol settings and fine-tune and/or replace, if feasible, existing information technology infrastructure equipment in support of the Phoenix Overseas Deployment project.

Management Decision: The IRM Director will define a technology refresh plan by July 2005 and based on funds being provided for the plan, will begin implementing by August 2005. IRM has established procedures to monitor the corporate circuits over VSAT and DTS-PO. (August 2005)

Recommendation 2: We recommend that USAID's Director, Office of Information Resources Management, implement a process to periodically identify alternate sources of telecommunications service providers and emerging technologies, especially in lesser-developed or remote areas where telecommunications infrastructure is limited, such as in the Africa and Asia and Near East regions to help improve USAID's information technology infrastructure performance in support of the Phoenix Overseas Deployment project.

Management Decision: IRM currently reviews sources of telecommunications service on a mission-by-mission basis as part of ongoing operations activity and preparation for missions having Phoenix deployed and we will continue to do so. We will also continue to coordinate with USAID missions, the Department of State and DTS-PO to share information about alternate service types/service providers in the locations where the Agency requires service. (Completed)

Recommendation 3: We recommend that USAID's Chief Information Officer update USAID's Information Resources Management Strategic Plan to address the Agency's information technology requirements, priorities, and infrastructure challenges over the next five years and information technology goals articulated in the State Department's Information Technology Strategic Plan, Fiscal Years 2006-2010, Goals Paper (which is based on the 2004-2009 Department of State and USAID Strategic Plan).

Management Decision: The USAID CIO will update the USAID Information Management Strategic plan. This plan will reflect the ongoing coordination and joint planning efforts between USAID and the Department of State. (August 2005)

Recommendation 4: We recommend that USAID's Chief Information Officer develop and implement a process to annually update USAID's Information Resources Management Strategic Plan.

Management Decision: The USAID CIO will establish a process to periodically update the USAID Information Management Strategic Plan. (August 2005) And we will revise the ADS to read periodically.

Recommendation 5: We recommend that USAID's Director, Office of Information Resources Management, develop and implement goals, standards, and processes that are consistent with industry best practices for measuring and reporting on USAID's worldwide area network performance, such as expanding the use of performance monitoring tools agency wide.

Management Decision: IRM has evaluated the current data we have on connectivity and formalize standards for response times, bandwidth saturation, and error rates; collects metrics in these categories by type of connectivity VSAT, DTS-PO, ISP; and set standards for connectivity. (Completed)

Recommendation 6: We recommend that USAID's Director, Office of Information Resources Management, implement a process to actively monitor and prepare performance reports on the virtual private network/internet service provider network path.

Management Decision: IRM has implemented a process to monitor and collect metrics on VPN/ISP paths that are currently in use at USAID missions. (Completed)

Recommendation 7: We recommend that USAID's Chief Financial Officer, in collaboration with the Chief Information Officer and the Director, Office of Information Resources Management, develop and implement formal performance goals for transaction response times in Phoenix in all worldwide locations.

Management Decision: The Chief Financial Officer is currently collaborating with the Chief Information Officer and the Director, Office of Information Resources Management, on developing formal performance goals for Phoenix transaction times based on industry best-standards. These performance goals would apply to all missions that receive Phoenix. Once performance testing and user feedback at some of the more technically-challenged missions is completed and performance goals are established, the CFO's will implement worldwide performance goals. (November 2005)

Recommendation 8: We recommend that USAID's Chief Financial Officer, in collaboration with the Chief Information Officer and the Director, Office of Information Resources Management, implement a process to actively monitor transaction response times in Phoenix in all worldwide locations.

Management Decision: Once the performance goals for Phoenix transaction times, based on industry best-standards, are established; the Chief Financial Officer, with consultation from the Chief Information Officer, will implement a system to proactively monitor Phoenix response times in the overseas missions. (November 2005)

Recommendation 9: We recommend that USAID's Chief Financial Officer, in coordination with the Chief Information Systems Security Officer, develop, test, and implement a viable Phoenix Overseas Deployment project business contingency plan for slow network connectivity.

Management Decision: The Chief Financial Officer is currently coordinating with the Chief Information Officer and the Director, Office of Information Resources Management, in developing, testing and implementing a business contingency plan for slow network connectivity. (November 2005)

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USAID's WAN Performance

Interconnectivity between USAID/Washington and 45 Phoenix Missions Average "Best Case" Rankings[31]

	Mission Name	City Name	Regional Bureau	Avg Best Case RTT (ms)	Best case network path
1	El Salvador	San Salvador	LAC	85	ISP/VPN
2	Honduras	Tegucigalpa	LAC	91	ISP/VPN
3	Bosnia Herzegovina	Sarajevo	E&E	115	ISP/VPN
4	Guatemala	Guatemala City	LAC	124	ISP/VPN
5	***Colombia (Pilot)***	Bogota	LAC	135	ISP/VPN
6	RSC-Hungary	Budapest	E&E	166	ISP/VPN
7	Ukraine	Kiev	E&E	167	ISP/VPN
8	Russia	Moscow	E&E	171	ISP/VPN
9	***Egypt (Pilot)***	Cairo	AFR	178	ISP/VPN
10	***Peru (Pilot)***	Lima	LAC	192	ISP/VPN
11	Haiti	Port-au-Prince	LAC	209	ISP/VPN
12	West Bank/Gaza	Tel Aviv	ANE	219	ISP/VPN
13	Morocco	Rabat	ANE	222	ISP/VPN
14	Dominican Republic	Santo Domingo	LAC	235	ISP/VPN
15	Jordan	Amman	ANE	266	ISP/VPN
16	Bolivia	La Paz	LAC	267	ISP/VPN
17	Philippines	Manila	ANE	278	ISP/VPN
18	South Africa	Pretoria	AFR	284	ISP/VPN
19	Senegal	Dakar	AFR	288	ISP/VPN
20	Nicaragua	Managua	LAC	297	ISP/VPN
21	India	New Delhi	ANE	352	ISP/VPN
22	Montenegro	Pogdorica	E&E	377	ISP/VPN
23	Kosovo	Pristina	E&E	390	ISP/VPN
24	Indonesia	Jakarta	ANE	415	ISP/VPN
25	Pakistan	Islamabad	ANE	435	ISP/VPN
26	Jamaica	Kingston	LAC	447	DTSPO
27	Southern Africa Regional (Botswana)	Gaborone	AFR	473	ISP/VPN
28	***Nigeria (Pilot)***	Abuja	AFR	546	VSAT
29	***Ghana (Pilot)***	Accra	AFR	571	VSAT
30	Kazakhstan	Almaty	E&E	602	ISP/VPN
31	Uganda	Kampala	AFR	611	VSAT
32	REDSO/EA Kenya	Nairobi	AFR	612	VSAT
33	Guinea	Conakry	AFR	614	VSAT
34	Malawi	Lilongwe	AFR	633	VSAT
35	Ethiopia	Addis Ababa	AFR	639	VSAT
36	Zimbabwe	Harare	AFR	643	VSAT
37	Georgia	Tblisi	E&E	648	VSAT
38	Nepal	Kathmandu	ANE	668	VSAT
39	Madagascar	Antananarivo	AFR	674	ISP/VPN
40	Mali	Bamako	AFR	675	VSAT
41	Mozambique	Maputo	AFR	683	VSAT
42	Benin	Cotonou	AFR	692	VSAT
43	Afghanistan	Kabul	ANE	697	VSAT
44	Cambodia	Phnom Penh	ANE	722	ISP/VPN
45	Bangladesh	Dhaka	ANE	745	ISP/VPN

[31] The amounts presented in this table were provided by M/IRM/ENMS and its process for compiling the amounts was audited. The network performance data is comprised of average daily Round Trip Time (RTT) readings in September and October 2004 for DTSPO and VSAT. For ISP/VPN, the RTT readings are the averages of one sample day in October and one sample day in November 2004. RTT rankings are sorted from fasted to slowest interconnectivity.