Commentary on "Bridging Africa's Broadband Divide"

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In the most recent edition of IEEE's Spectrum magazine, authors David Johnson and Chomora Mikeka write about rural towns in Malawi and South Africa who are repurposing unused television frequencies for high-speed internet. The waning usage of analog television due to the digital conversion has opened up room on the VHF and UHF (very high and ultra high frequencies) spectrum. At the local Mulanje Middle School, students have worked with teachers as well as the local telecom provider to utilize these old antennae frequencies to allow for over-the-air internet access. Now, students can check e-mails, do homework, and visit social media sites through these cheap WiFi solutions. In fact, TV white space at 600MHz has potential to cover 16 times the area of a regular 2.4GHz WiFi network.

Generally, many data structures are in use with this kind of computer networking. The most recognizable is the Queue. Practically all information sent through the Internet involves network packets. These packets carry data that assist it to reach the user, load sections of e-mails, or even the destination of the information. When a request to load a webpage is made, series of packets are transmitted to and from the client, in a first-in, first-out fashion. This structure is most similar to the Queue abstract data type. The students in Malawi worked to optimize the WiFi channel their networks were transmitting on, because the more requests that are being made on one particular channel, the longer it is for them to get fulfilled, due to the longer queue.

On another level, the List ADT is most complementary to the core protocol of the Internet protocol suite (TCP/IP). When transferring data through the World Wide Web, an email server, or online work network, TCP transmits data in ordered sequences. More specifically, it streams bits of information to and from connected devices on a network. This makes TCP most similar to the List data structure; whether it be

implemented through a Vector, Array, or ArrayList, it is how computers understand and contain a sequence of data. The information sent through the Internet may also be implemented through a Linked List, where each set of bytes is directly matched with another. If a student from one of the discussed African towns sends a file attachment through instant message, these packets could be sent through a List implementation, containing a sequence of pointers to the next part of the message or to that associated attachment.

The impact of engineering networking solutions from deprecated hardware is remarkably positive to the South African society. These African towns can now access more than one world's worth of information, which can lead to the furthering of academics, discovery, and algorithm development. And now, through their usage of queued packets and sequential bits on a low level, the future engineers of these cities can construct methods for high level data transfer, inluding faster transmission of images, websites, and platforms. Understanding how networking and data transmission operates at the software level is crucial to the advancing of the technology as a society.

References

[1] Johnson, David and Mikeka, Chomora. "Bridging Africa's Broadband Divide." IEEE Spectrum, 16 Sept. 2016, pp. 43-46