Terrestrial Connections

In a world with ever increasing technology, locally available and locally provided telephony and internet service is becoming more and more accessible. Locally provided service is referred to here as service provided by and to parties within countries of response, usually by local companies who may or may not operate in other countries.

Surveillance and Intervention

Locally provided telephony and internet may end up being cheaper and faster than any other solution, and the use of local services is encouraged where safe and available. Humanitarian agencies operating in multiple contexts should always keep in mind that local voice and data providers always operate under the authorisation and limits of national authorities and regulations.

Many phone carriers and internet service providers are required to provide surveillance to governments about some or all users of their services. In some cases, telecommunications companies are partially or wholly owned by governments, and may be extensions of state intelligence or security apparatuses. In extreme cases, telephone and internet service may be shut off or denied to key persons, organisations, or all users of the service at once due to concerns over conflict, political unrest, or other security related matters.

Humanitarian agencies utilising locally provided voice or data services should always operate under the assumption that their activities may be surveyed or monitored at any time, and seek out redundant communications systems in case of internet or voice being shut off for whatever reason. Some governments heavily restrict the usage of outside or independent communications, such as radio or satellite communications, limiting options for redundant communications may vary from mission to mission.

Mobile Phones / Data

Mobile phones and mobile provided data are quickly becoming ubiquitous throughout the world. While most people are becoming familiar with the regular use of mobile phones and data, there are a few things to keep aware of.

Wireless Carriers/Providers

Wireless carries and wireless providers are companies that interface directly with clients to provide wireless mobile service. The wireless carrier is often the same company the pays for the installation of a wireless network, however frequently providers rent or lease bandwidth from other company's cell phone towers to enhance their coverage.

A wireless carrier established in any given country will have close ties to regulators, working within the national laws and restrictions for provision of wireless communications. Due to the fact each country may have subtle differences in wireless regulation or usage based historical or financial reasons, the specifics of the service provided in each country may be slightly different. Each wireless carrier in a country will broadcast on slightly different frequencies to ensure their individual signals have the least interference. Specific "instructions" telling the phone exactly which frequency to speak on come from the SIM card provided by the carrier.

Mobile Virtual Network Operator (MVNO)

In recent years, there has been an increase in what are called Mobile Virtual Network

Operators (MVNOs). MVNOs are mobile providers who don't actually own or manage any of their own network infrastructure, and instead are essentially companies who's service rests upon other service providers.

The MVNO model may seem counter intuitive – paying for a company who then pays another company seems like it should always be more expensive. The MVNO model has distinct advantages, however; MVNOs can buy service on multiple networks, including international networks, yet continue to provide one singular seamless service to users. MVNOs can also buy bandwidth and airtime in bulk from other larger carriers, and sell smaller portions to multiple parties who may not be willing or able to pay for traditional large service packages.

Wireless Protocols

Global System for Mobile Communications (GSM)	The most widely adopted wireless communication protocol for mobile phones. GSM was developed by European Telecommunications Standards Institute as a method of dealing with standards across multiple countries in Europe, and has since become the default for most countries globally. GSM is easiest to identify by the use of SIM cards.
Code-division multiple access (CDMA)	An older and less widely adopted wireless communications protocol, first established prior to the invention of the modern mobile phone. CDMA makes up less than 10% of global mobile communications. CDMA phones don't utilise SIM cards as a mode of linking the phone to the carrier, however many CDMA phones have SIM card slots for GSM usage as well. CDMA phones must be directly programmed to speak to the mobile carrier network, and often CDMA phones can only ever be used for one provider.

GSM has become the dominant standard globally. In the early days of commercial cell phone service, carriers would sell phones that would only work on their specific frequency, which helped drive costs down because phones only had to have one set of antenna. This would however lock phone usage to single networks and discouraged competition. Consumer advocacy groups and a rise in phones used in international markets prompted the sale of phones that work on all available frequencies available at the time of manufacturing. Modern cell phones can accommodate operating on a wide variety of carrier networks, and with the rise of large singular brands and globally popular phones also helps keep manufacturing standardised.

Even with phone capable of supporting multiple frequencies, carriers will still sometimes sell locked phones – meaning the phone is programmed to only operate within that specific carrier network. This is usually justified by the fact the carrier might have subsidised the cost of the phone to the consumer, and is recovering the cost through monthly service fees. The practice of locking phones is becoming widely discouraged, however it still occurs in many places.

In some contexts, using a single mobile carrier is not sufficient, and users may wish to use two or more. Many mobile phones come with slots for two SIM cards, or may even have the ability to connect to both CDMA and GSM networks.

When acquiring mobile phones, humanitarian agencies should consider:

- Does this phone need to operate in a different country?

- Does this phone need to connect to more than one carrier?
- Will the phone need to be unlocked, or will it work natively with any network?
- Does this phone have the capacity to operate in the areas where it is needed?

Mobile Phone Generations

The technology surrounding how mobile communications work are segregated into "generations" or referred to a "G" for short. This is frequently shortened even more to a number to help reduce confusion, such as 3G, 4G, 5G, etc…

There is no one specific technology that composes a "generation," rather a generation is defined by a series of minimum standards, including voice communication encryption, data speeds and certain specifications for phone design. Each new generation of mobile communication is accompanied by new processors and new antenna technology which may not be compatible with previous generations. As such, as new mobile phone generations are introduced, older mobile devices will probably not work with new services.

Mobile Data

Internet service from mobile carriers has become ubiquitous and almost more important than regular voice communication. The same limitations on hardware, wireless protocol, generations, carrier lock ins and general coverage still apply to data specific mobile applications. If humanitarian agencies are planning on acquiring mobile hot spots or dongles, they should consider all areas of operation equally as they would a mobile phone.

Landline

Traditional landline communication is one of the oldest methods of electronic communication still in usage in humanitarian contexts. Landline voice communications are facilitated through physical infrastructure, usually telephone lines transmitting signals through large copper wires. Individual homes and offices are connected to the telephone network through a physical connection, usually requiring some form of professional installation from the telephone provider. Phones with dedicated phone numbers are called "dedicated lines."

Wireless communications are quickly eclipsing the use of physical landlines, especially in humanitarian contexts where physical landline telephony might not have been available in the first place. Landlines are also susceptible to physical damage and may be harder to repair. Many agencies may wish to use landlines because they are probably cheaper, and offer specialised business support. The choice to go with a landline dedicated phone is up to each agency, however it is recommended to always have redundant systems of communication to avoid problems should one system be cut off.

Internet Service

An Internet Service Provider (ISP) is any provider of internet in any format, however the term ISP is usually closely associated with internet provided by in-country terrestrial based companies. Traditionally, ISPs provided internet over telephone lines, however there is currently a wide spectrum of different methods of providing internet to a fixed location, including phone, cable, fibre optic, and even point to point wireless. As mobile communications have become increasingly popular, the methods and nature of ISP provided internet service has started to blur with other forms of mobile communication.

The global internet infrastructure is extremely complicated and ever evolving. In the broadest

terms possible, local ISPs serve as the bridge to services and content largely hosted outside of the country of operation. General concepts for internet service provision are:

IP Address - Every computing device connected to the internet has what is called an IP address, short for Internet Protocol Address.

Web Servers - Web services – such as websites and apps – are hosted on large "servers", computers that store data and respond to incoming queries. Servers have IP addresses just like personal computers. Web hosting servers may or may not be in the same country as the person using the service hosted on the server. Many large companies have started hosting large numbers of services in one or a few locations globally.

URLs - The name of a website (example:www.logcluster.org) are defined as Uniform Resource Locators (URLs). URLs are what most people commonly understand as web site addresses.

DNS - Specialised servers called Domain Name Servers (DNS) are what hold the key to translating what we know as URLs into the unique IP addresses of remote servers. DNS servers may or may not be controlled by ISPs in a specific country.

Local ISPs have incentives or disincentives to prioritise or block certain traffic. Many local laws prohibit certain types of content for cultural or political reasons. Additionally, weak local regulation may result in privately owned ISPs favouring some companies or services over others, purely out of collusion or anti-competitive practices. ISPs have the ability to filter or block websites fairly easily, especially if they manage their own DNS servers.