



Understanding the strengths and weakness of various access technologies

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Body guide to **network parts**



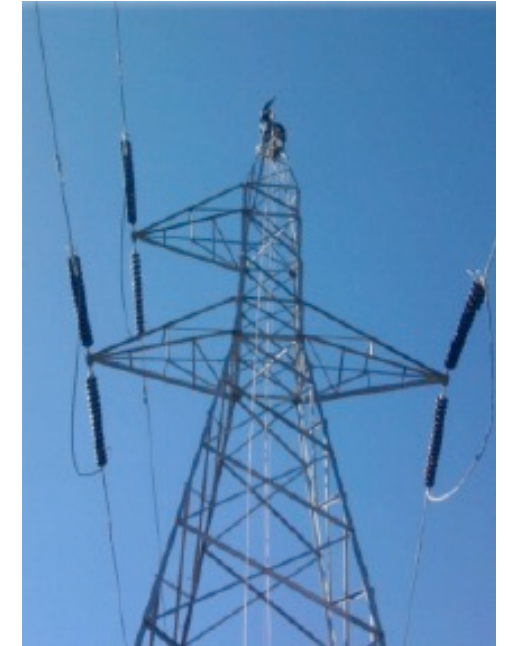
- Backbone: **top level connectivity**
- Head: **network intelligence**
- Backbone, head and pelvis: **core network**
- Arms and legs: **backhaul (or middle mile)**
- Fingers and toes: **access (last mile, or first mile)**

This session is about fingers and toes – but everything must be joined up to work right!

And note that everything needs **ELECTRICITY!**



Connecting using wires (copper or optic fibre)



Source: Bhutan Power Corporation



1970s history - immobile telephony

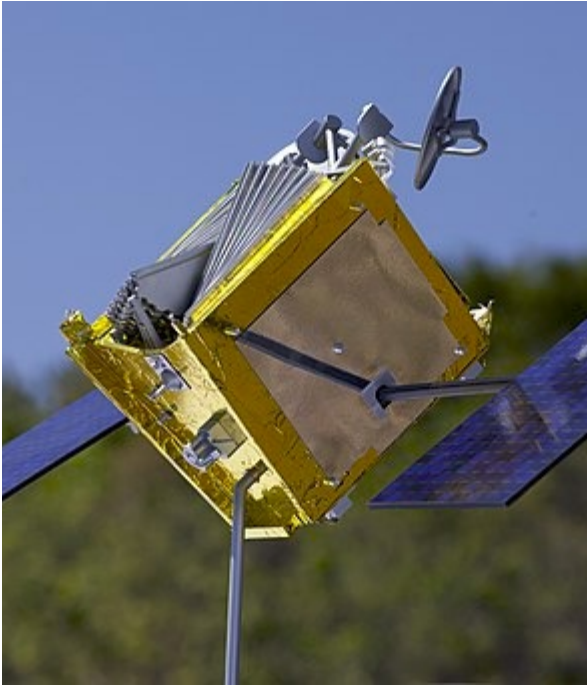


Pros and cons of wired connection

- If connections available nearby, not too expensive
- No spectrum requirement
- Optic fibre gives very high capacity and range
- Reliable (especially underground)
- Can last well, if protected from hazards (e.g. weather, animals*, theft, human abuse) *See [Elephant Playing With Road Side Exposed Optical Fiber Cable](#)
- Initial installation is expensive, especially underground
- Installation *often* needs regulatory permission and landowner agreement
- One termination serves one location
- Fixed to one spot
- Breakages can take time to find and mend



Wireless connection (terrestrial or satellite)



Sources (L to R): Wikimedia for OneWeb, author in Bhutan (x2), Librerouter



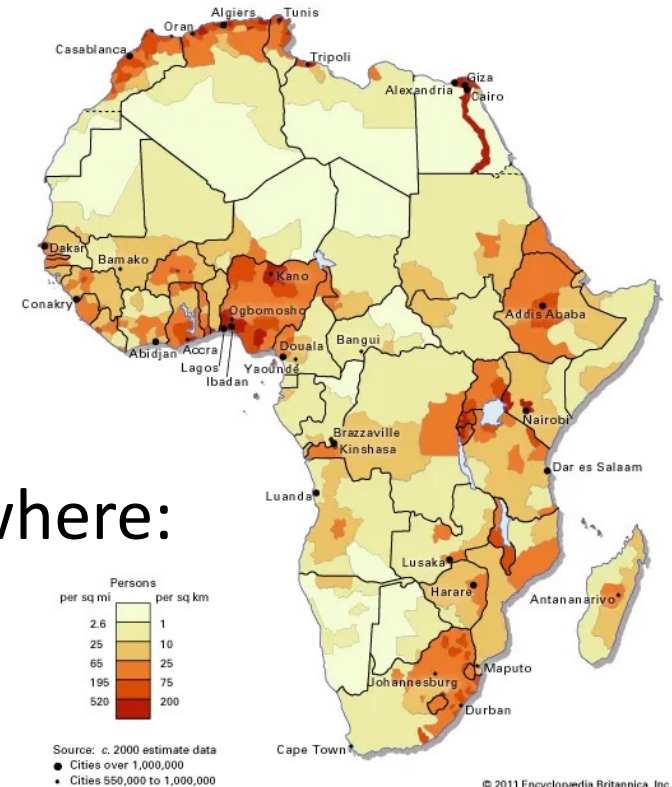
Pros and cons of wireless connection

- Initial installation can be relatively low cost
- One access point can serve many users
- Permits mobility (varying amounts)
- End-user equipment now often low cost
- Points where failure may occur are mostly known
- Needs spectrum, which must be managed to avoid interference (but wifi typically uses unlicensed spectrum)
- Installation *may* need regulatory permission and landowner agreement
- Connection quality may be affected by weather
- Both network and user equipment may be expensive

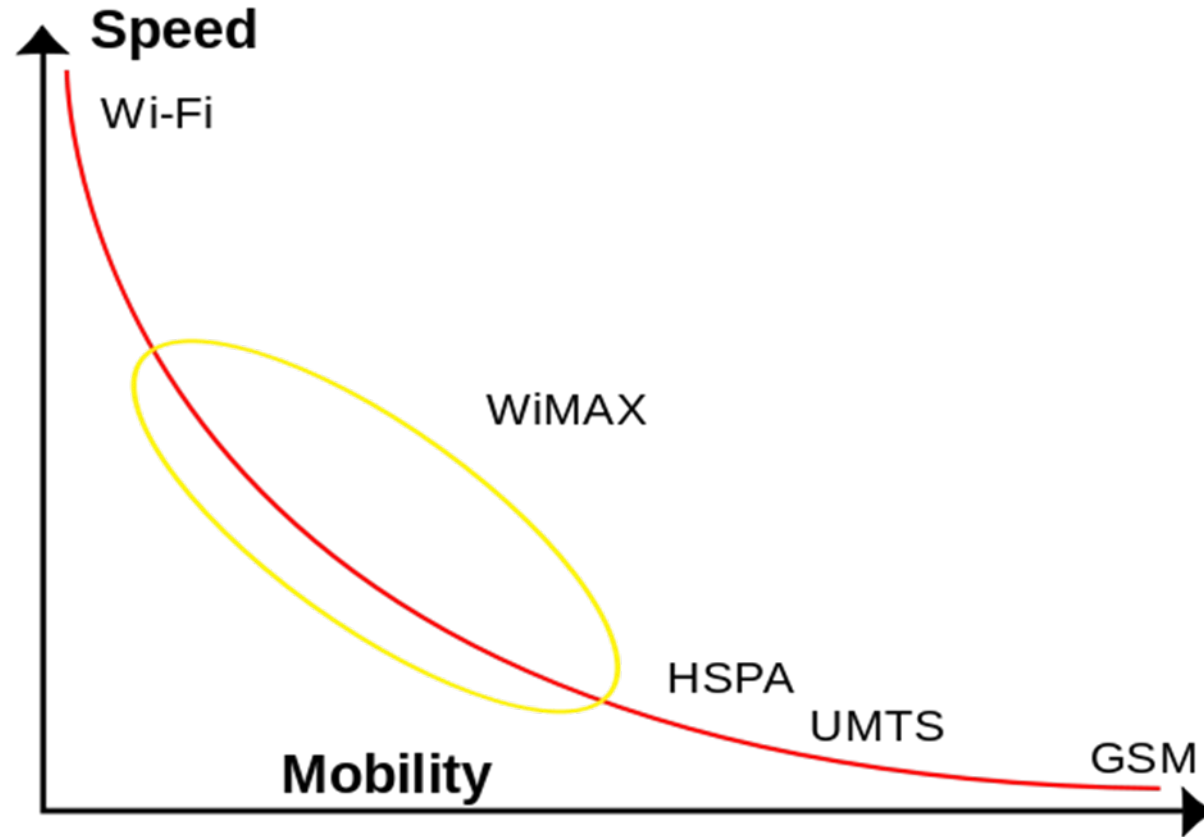


Wired vs wireless for community networks

- Note that both may need operational licensing
- Wired may work well in urban areas where:
 - Cables are already nearby
 - Many people live close together
 - Some money is available
- Wireless is often better, especially in rural areas where:
 - Cable is distant
 - People live in small groups, maybe far apart
 - Very little money is available
- So now focus on different kinds of wireless!



Wireless trade-offs: speed and mobility



By Benjamin M. A'Lee - Own work, CC BY-SA 3.0,
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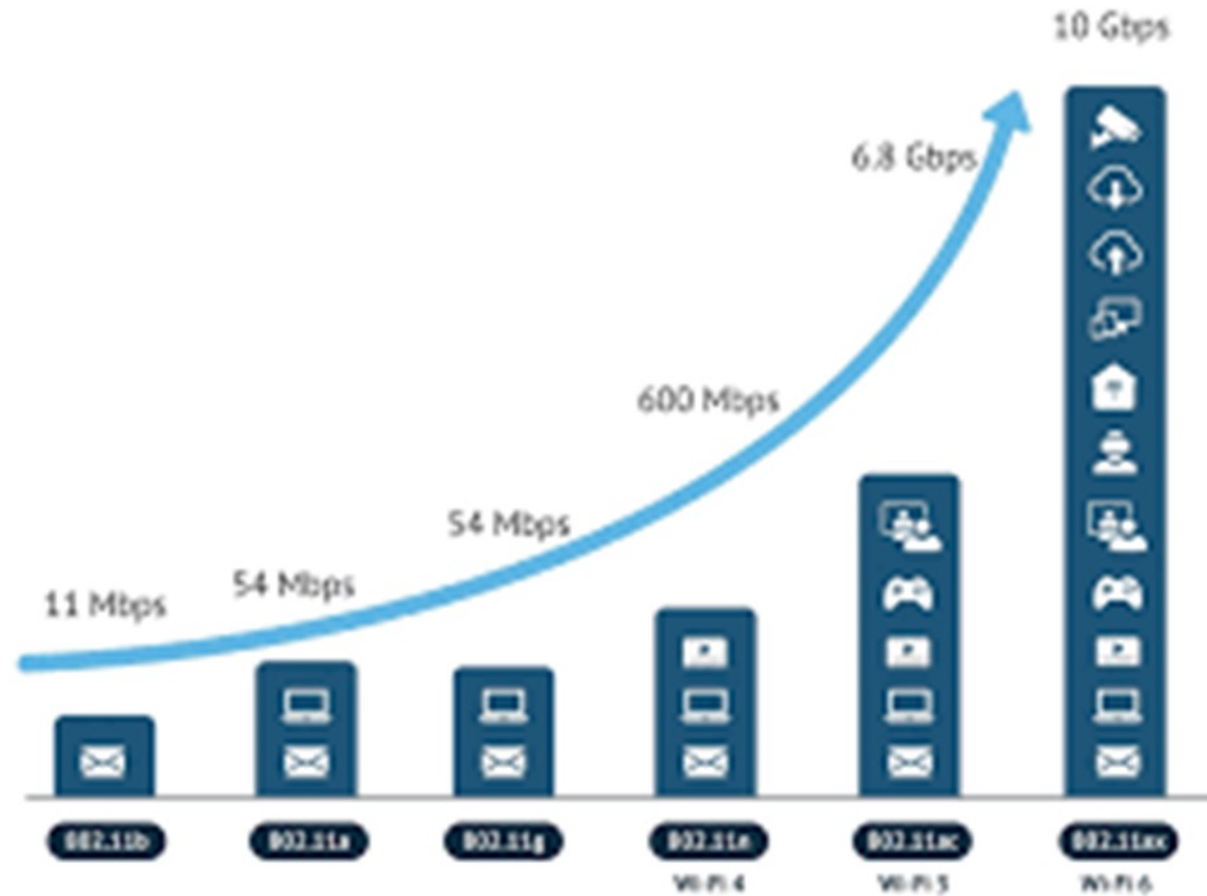
Main wireless access options for CNs

- Satellite:
 - Reaches practically everywhere
 - New types coming (LEOs, constellations)
 - Still expensive, limited bandwidth
- Cellular mobile:
 - 4G (decent internet) already reaches 88% of global population (85% in DCs)
 - Handsets get increasingly affordable
 - Control and costs are usually out of your hands
- Wifi:
 - Increasingly popular for 5G/IoT as well as CNs
 - Continuing tech development → better service, lower costs
 - Comes built into most laptops and mobile phones, with backwards compatibility
 - DIY skills required



Wi-fi evolution – last two decades

Source: Qorvo, www.qorvo.com





Thank you

Follow-up queries welcome – to Claire
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Please see useful background materials at
<https://locnetevents.apc.org/books/space-22/page/session-one-sep-27>