

CS3640 Written Assignment-3

Due: Apr 9, 2021 midnight
Submit as a single PDF on ICON

The first three questions are based on Prof. Henning Schulzrinne's guest lecture on 4/1/2021. If you need a refresher, please check the course website for slides and video.

Q1. Identifying the digital divide

25 points

Define digital divide (using your own words). Explain the three main factors that contribute to the said digital divide. Give an example, one for each factor, which demonstrate how they could inhibit individuals from attaining Internet connectivity (this could be anecdotal or references to media articles or published research).

Digital divide refers to the gap that exists between people who are able to benefit from digital technologies and those who cannot benefit owing to a lack of (quality) Internet connectivity. Three contributing factors are: availability (i.e., having access to an Internet service provider), affordability (i.e., having the ability to pay for the Internet access), and relevance (i.e, justifying the need for procuring high-speed Internet).

Here is an example for availability and affordability in Iowa (<https://www.thegazette.com/subject/news/government/2021-iowa-legislature-bills-rural-broadband-internet-speed-faster-20210111>). Example for relevance could be a farmer living in a sustainable community deciding to not get broadband Internet since it does not play a key role in his daily routine.

Q2. Digital divide and technology

25 points

What did the presenter mean by "accidental broadband"? Is it possible to leverage the already existing near-universal connectivity of electrical grid and telephone networks to deliver Internet connectivity to all? Justify your answer.

The phenomenon where Internet service is provided using infrastructure such as cable TV network and telephone network, both of which predated the invention of the Internet, is what is commonly referred to as accidental broadband.

Electrical and telephone networks help but do not fully solve universal Internet connectivity. This is because high-speed Internet requires (i) *build-out* i.e., laying new access technologies that

provide sufficient bandwidth and capacity like for example, fiber and (ii) *pay-out* i.e., designing new economic incentives since rural last-mile offerings do not generate sufficient revenue.

Q3. Digital divide and technology

25 points

Describe, using technical arguments, why achieving universal Internet connectivity requires a mix of networking technologies? Compare the benefits and shortcomings of five access technologies namely, cable, DSL, fiber, cellular, and satellite in terms of transmission rate, network capacity, and coverage area. (*PS: we have covered some of this in lecture-2*).

Achieving universal Internet connectivity translates to solving the build-out and pay-out challenges discussed above. Since none of the currently available technologies solve both perfectly, we are forced to consider a mix of them to balance the tradeoffs. Numerical values in the table below are indicative (and could vary considerably depending on the specific provider).

	Transmission rate	Capacity (GB/month)	Coverage distance
DSL	1-50 Mbps	100 - 1000	~2 miles from DSLAM
Cable	50 Mbps - 1 Gbps	1000 - Unlimited	~100 miles from CMTS
Fiber	250 Mbps - 1 Gbps	Unlimited	~10 miles from OLT
Cellular	10 Mbps	100 - Unlimited	~10 miles from tower
Satellite	1 - 100 Mbps	~ 100	nation-wide

Q4. April fools' day RFCs

25 points

We know that RFCs define Internet protocols, techniques, behaviors, and sometimes, even people! This is your chance to explore their funny side with April fools' day RFCs (https://en.wikipedia.org/wiki/April_Fools%27_Day_Request_for_Comments). While you are free to read as many (or as few) of these as you like, this question requires you to pick one and summarize its content in ~250 words. *Please remember that copying verbatim will earn you zero points.*

No reference answer.
