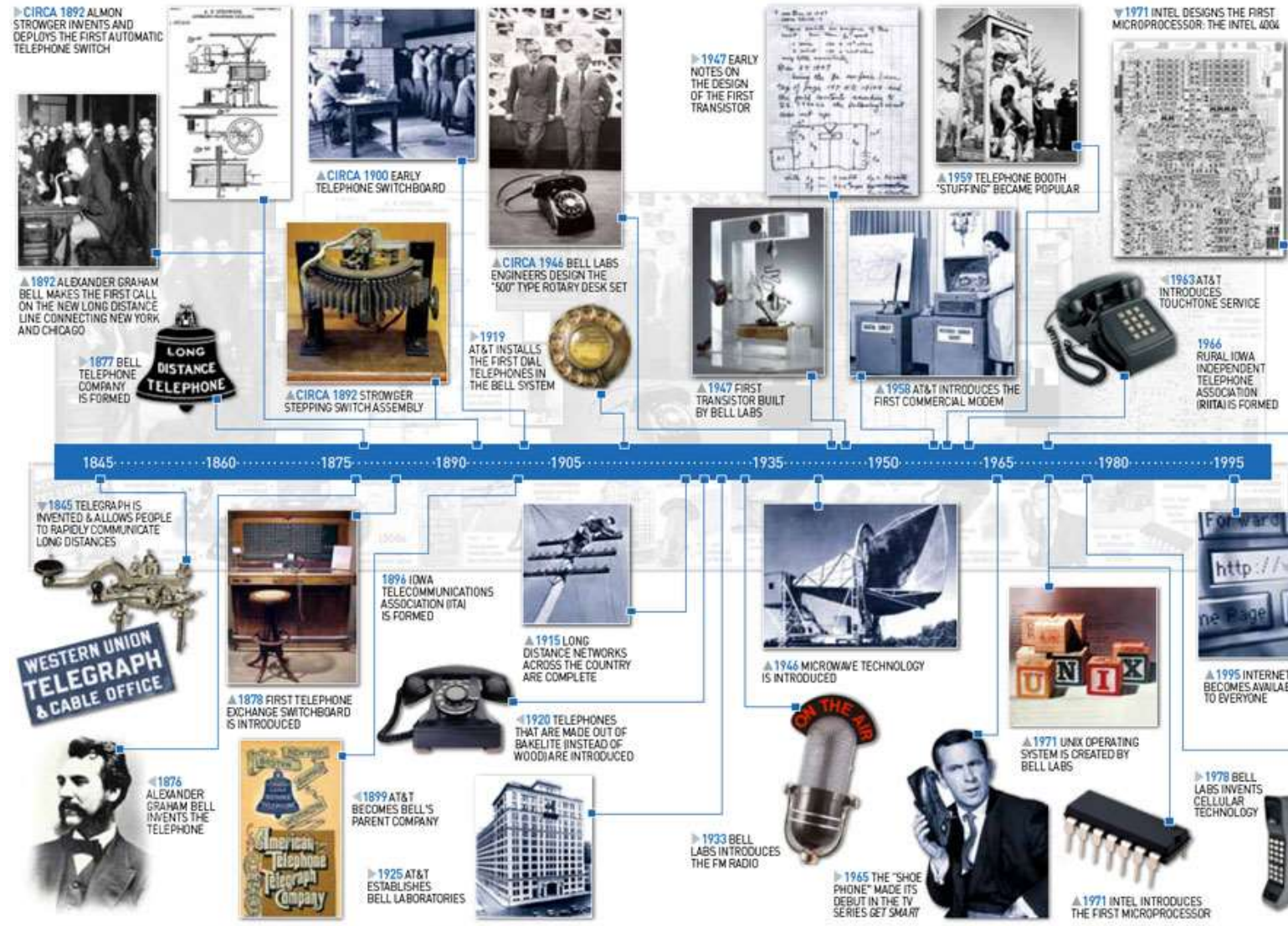


Wireless Communications Principles

Introduction

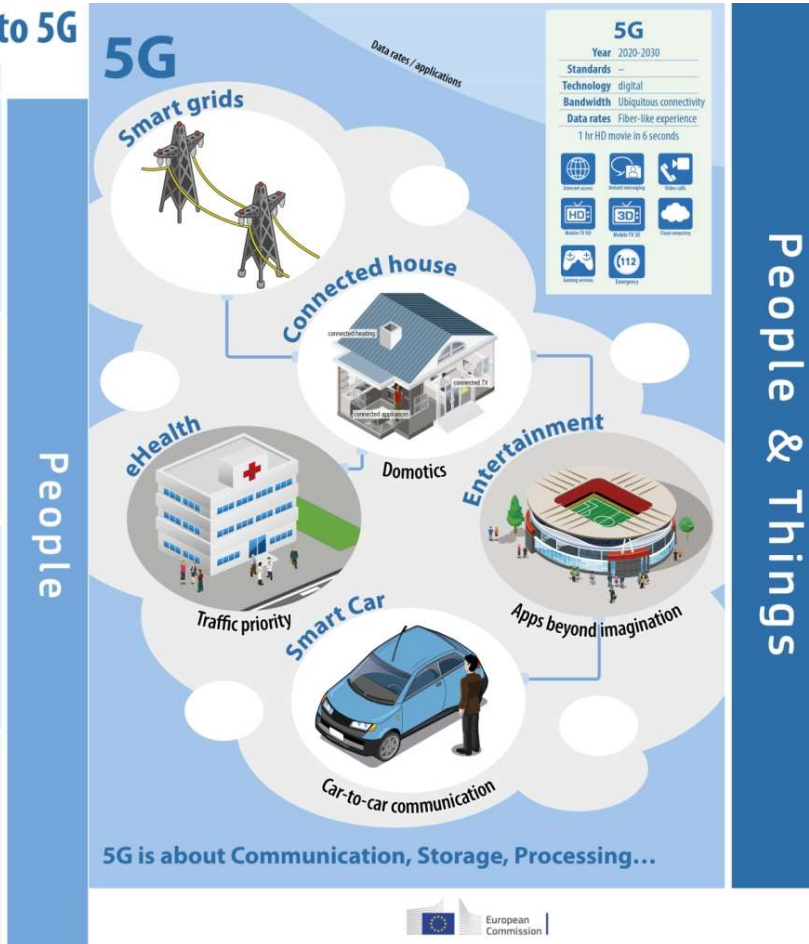
Historical Perspective



Mobile Communications

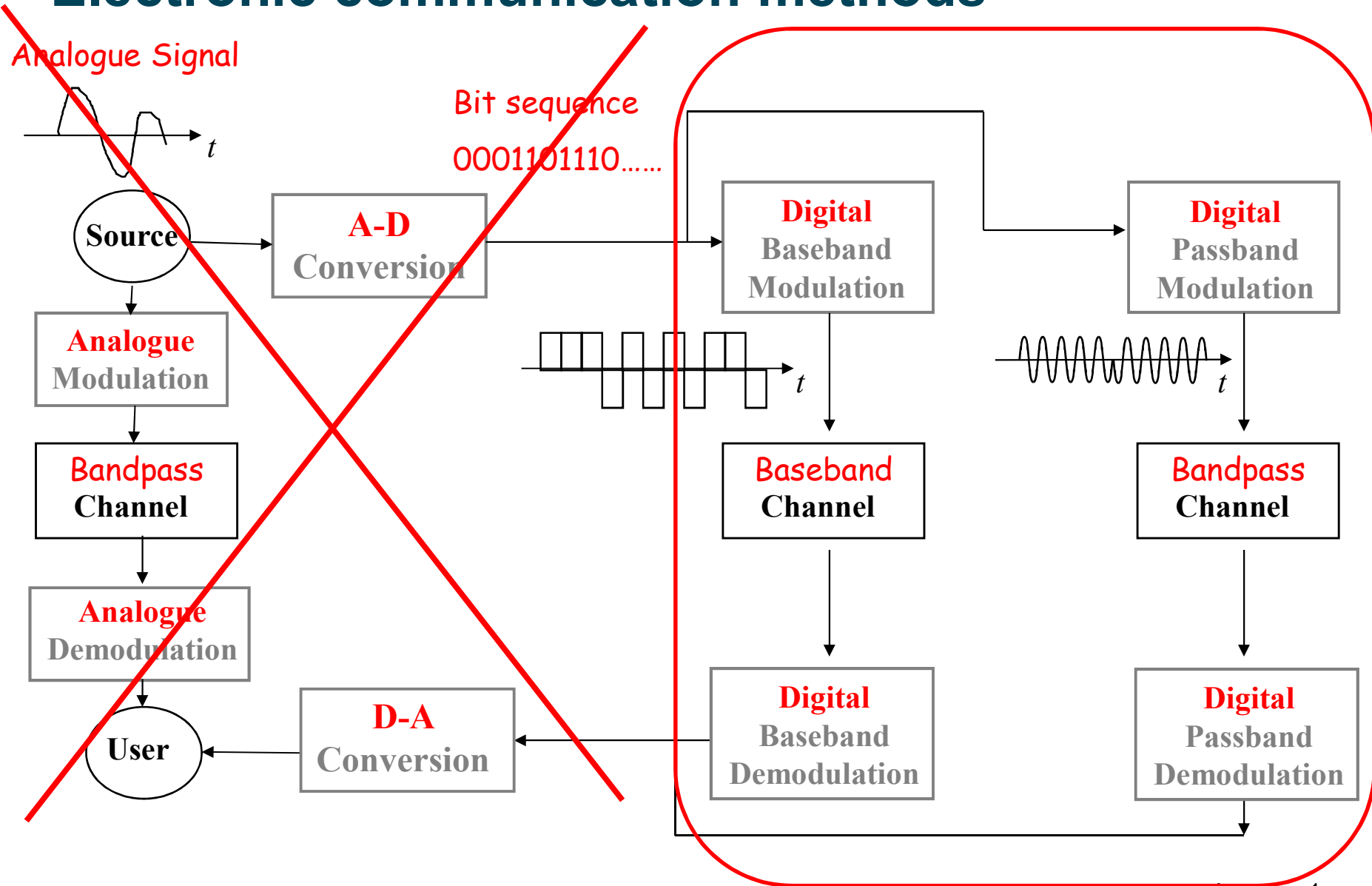
Mobile communications: from 1G to 5G

| Generation | Device | Specifications |
|------------|---|--|
| 1G |  | 1G Year: early 80s Standards: AMPS, TACS Technology: Analog Bandwidth: — Data rates: — |
| 2G |  | 2G Year: 1991 Standards: GSM, GPRS, EDGE Technology: Digital Bandwidth: Narrow Band Data rates: < 80 – 100 Kbit/s |
| 3G |  | 3G Year: 2001 Standards: UMTS / HSPA Technology: digital Bandwidth: Broad Band Data rates: up to 2 Mbit/s |
| 4G |  | 4G Year: 2010 Standards: LTE, LTE Advanced Technology: digital Bandwidth: Mobile Broad Band Data rates: xDSL-like experience 1 hr HD movie in 6 minutes |



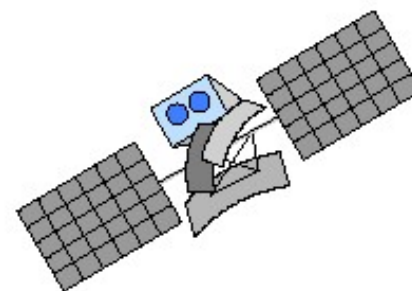
Source – <https://www.broadbandgenie.co.uk/features/5g-future-mobile-broadband>

Electronic communication methods



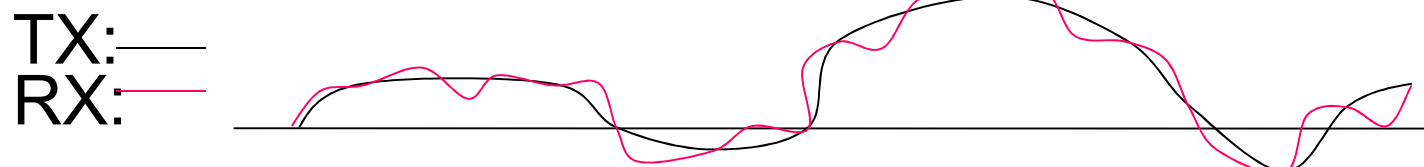
Why Digital Communications?

- Penetration of computers -> digital
- **Flexibility**: parameters can be easily changed to make tradeoffs
- Efficient digital signal processing (DSP)
- **Integrated services** of voice, video and data in a single network.

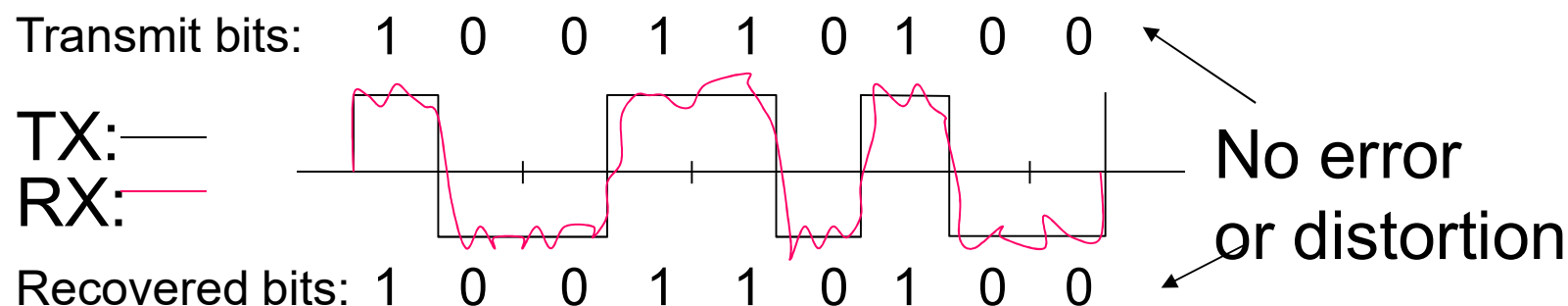


Why Digital Communications?

- Analogue Communications: difficult to recover signals as the TX analogue signal has an infinite number of values

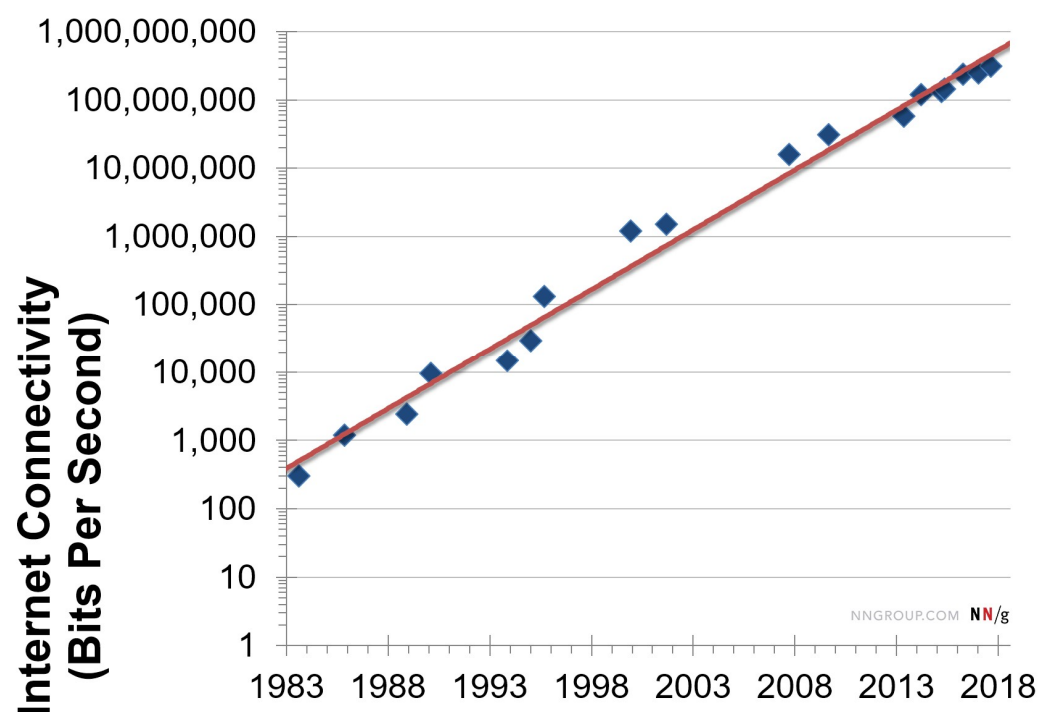


- Digital communications: more robust to errors



Why should I care about comms?

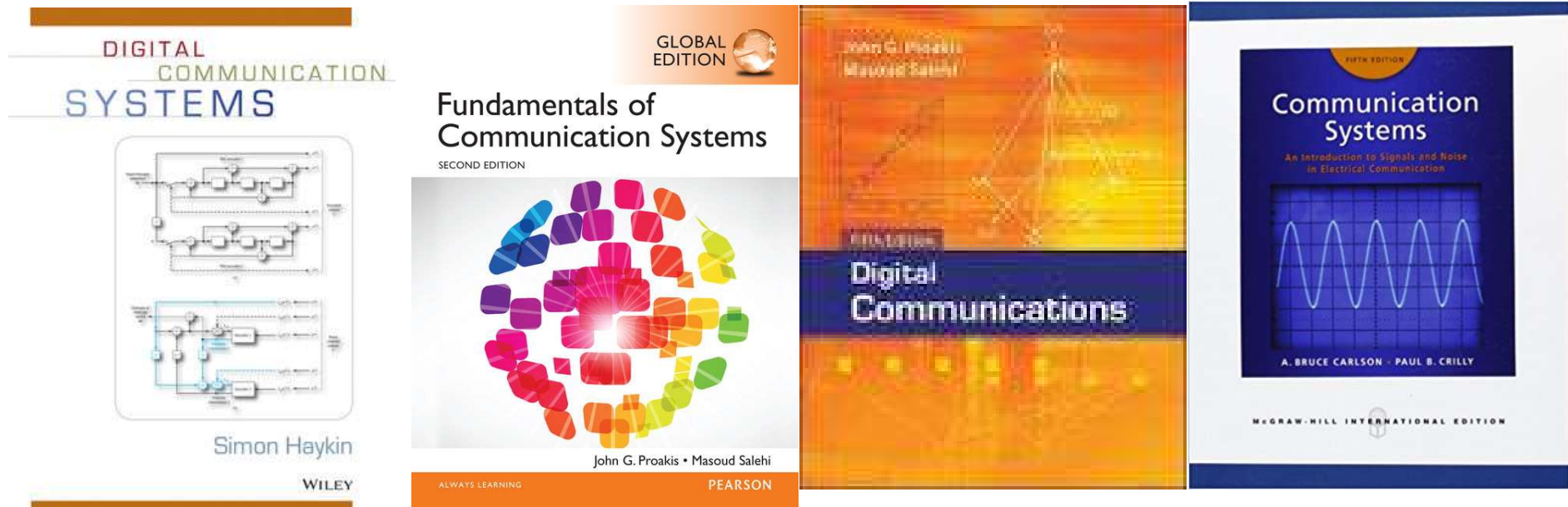
- *Nielsen's law*
- Summary: Users' bandwidth grows by 50% per year (1.7dB/year)
- Weirdest metric...
 - But accurate!
- Predicts **10 Gbit/s** by 2024



Source: <https://www.nngroup.com/articles/law-of-bandwidth/>

Read

- Chapter 1 in one of these...



... or an introductory chapter in another communication systems book (10 – 20 pages)