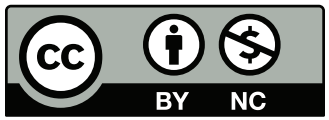
Ethics I



Values Matter

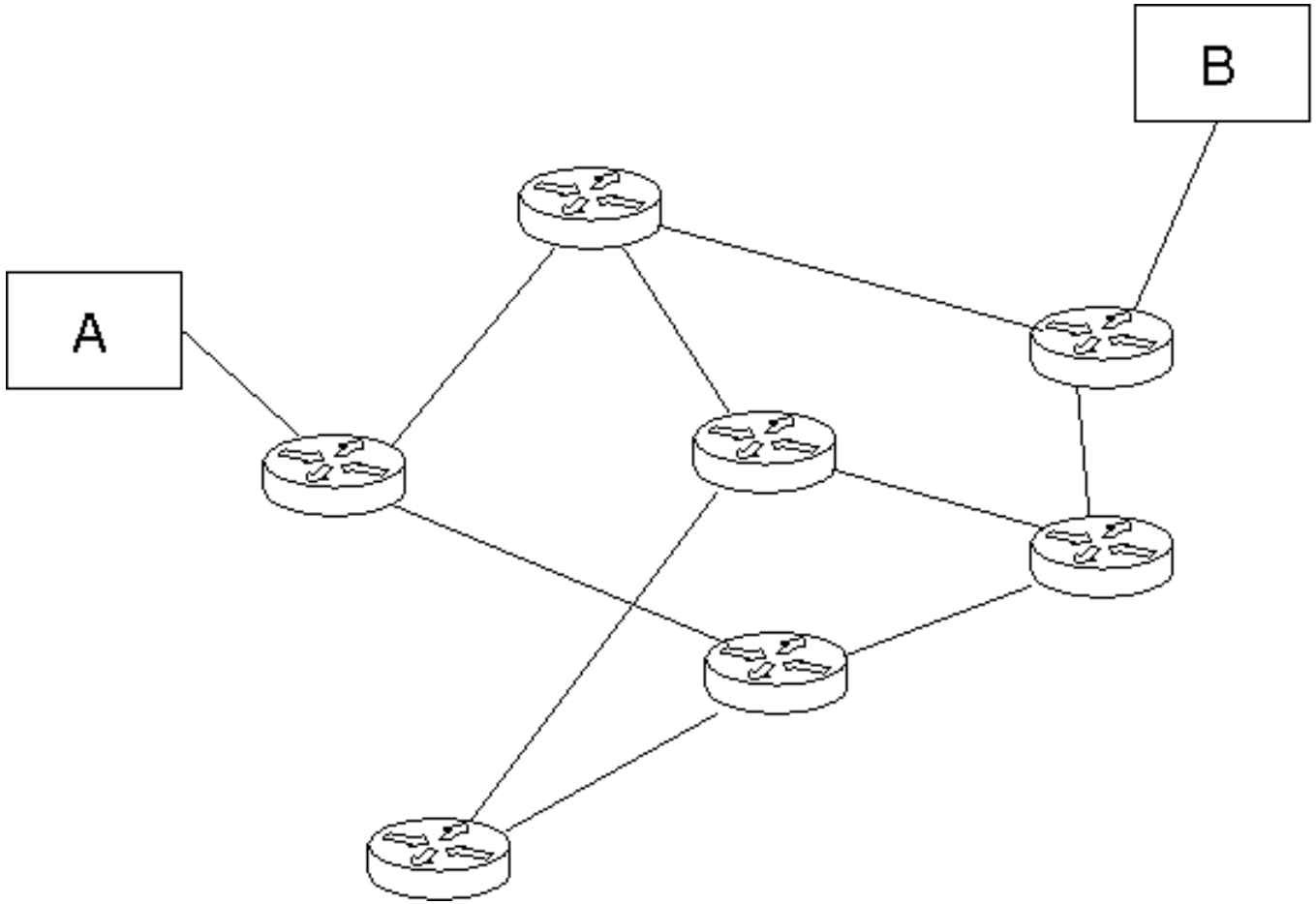
"Technology is not and has never been socially or politically neutral; it embodies and usually transmits the attitudes, economic endowments, moral priorities, and even the aesthetics of the societies that create it. It is very hard to simply adopt the machine and not the less tangible biases that go with it."

Walter Russell Mead
(http://www.the-american-interest.com/2015/04/09/the-paradox-of-american-democracy-promotion/)

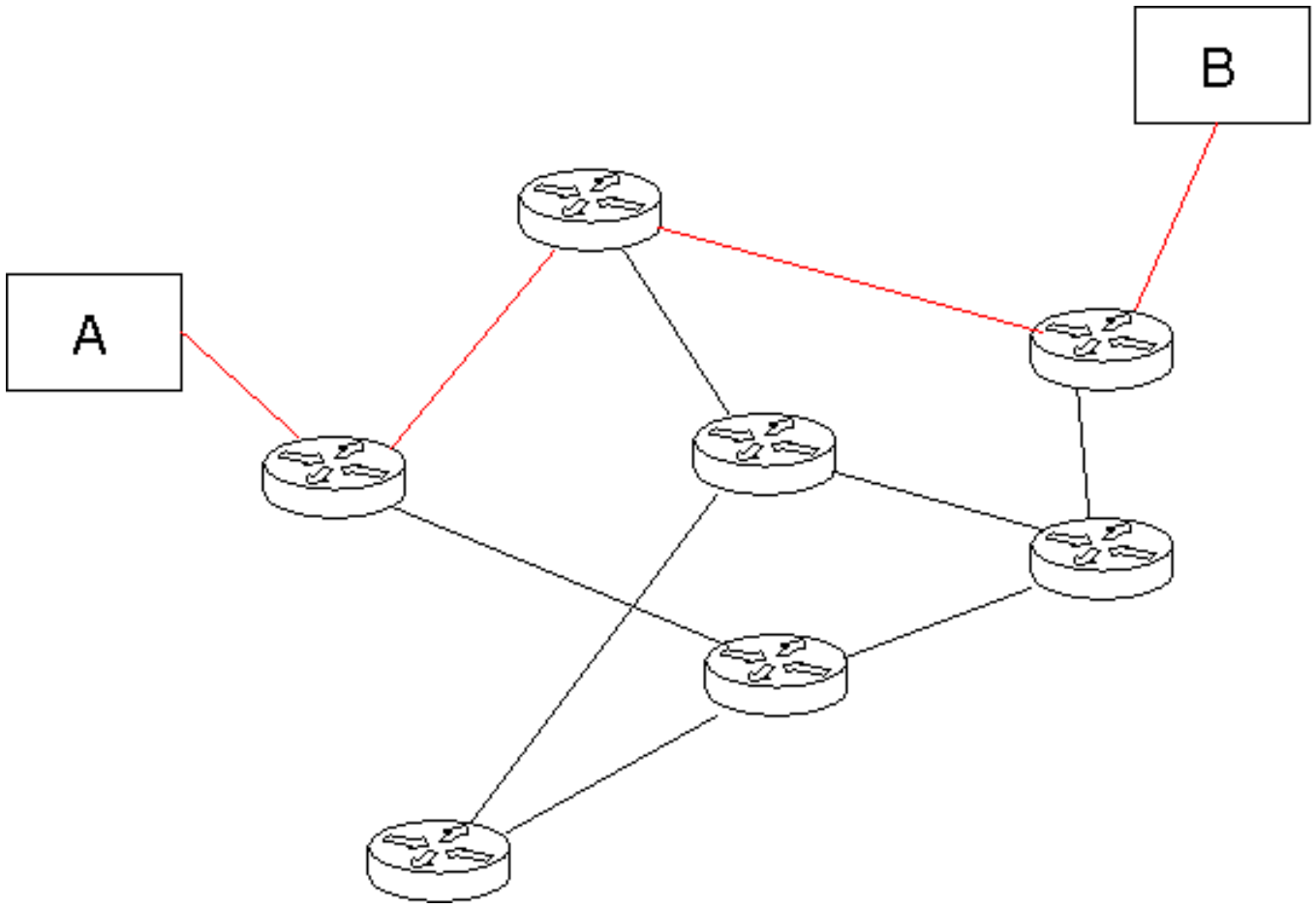
The Network Stack

7	Application
6	Presentation
5	Session
4	Transport
3	Network
2	Link
1	Physical

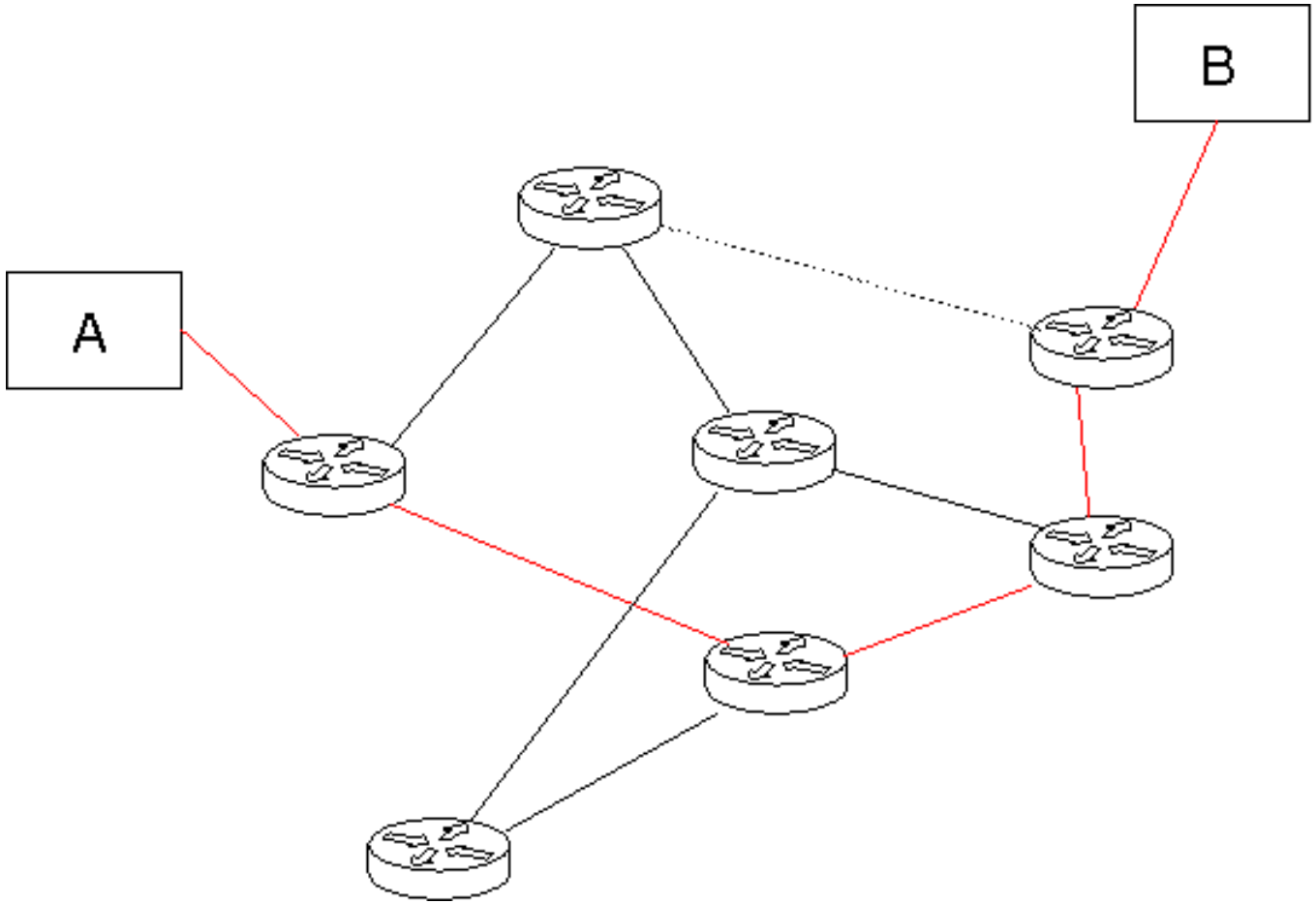
The Internet: Packets



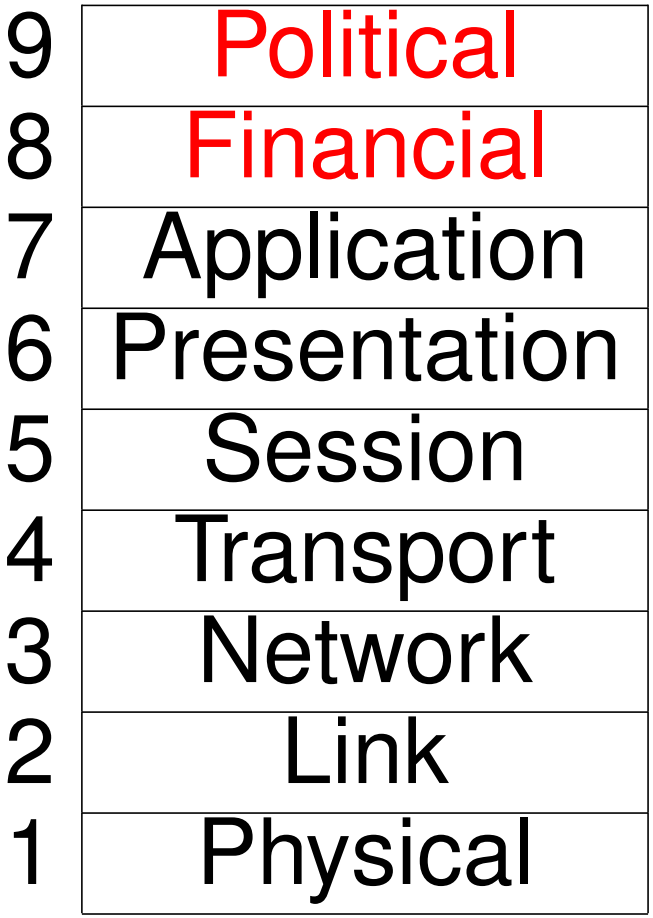
The Internet: Packet Routing



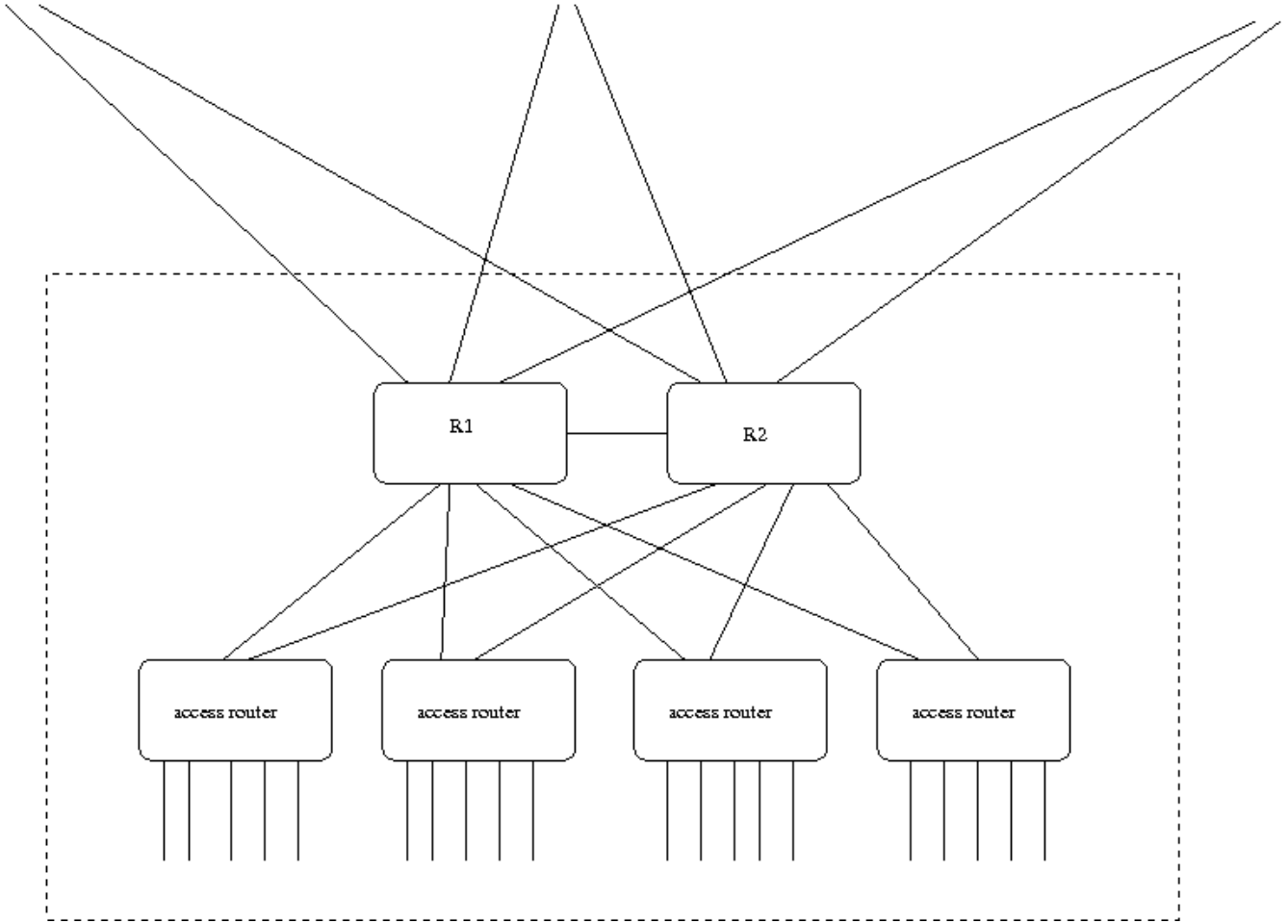
The Internet: Alternate Paths



The *Real* Network Stack



Points of Presence (POP)



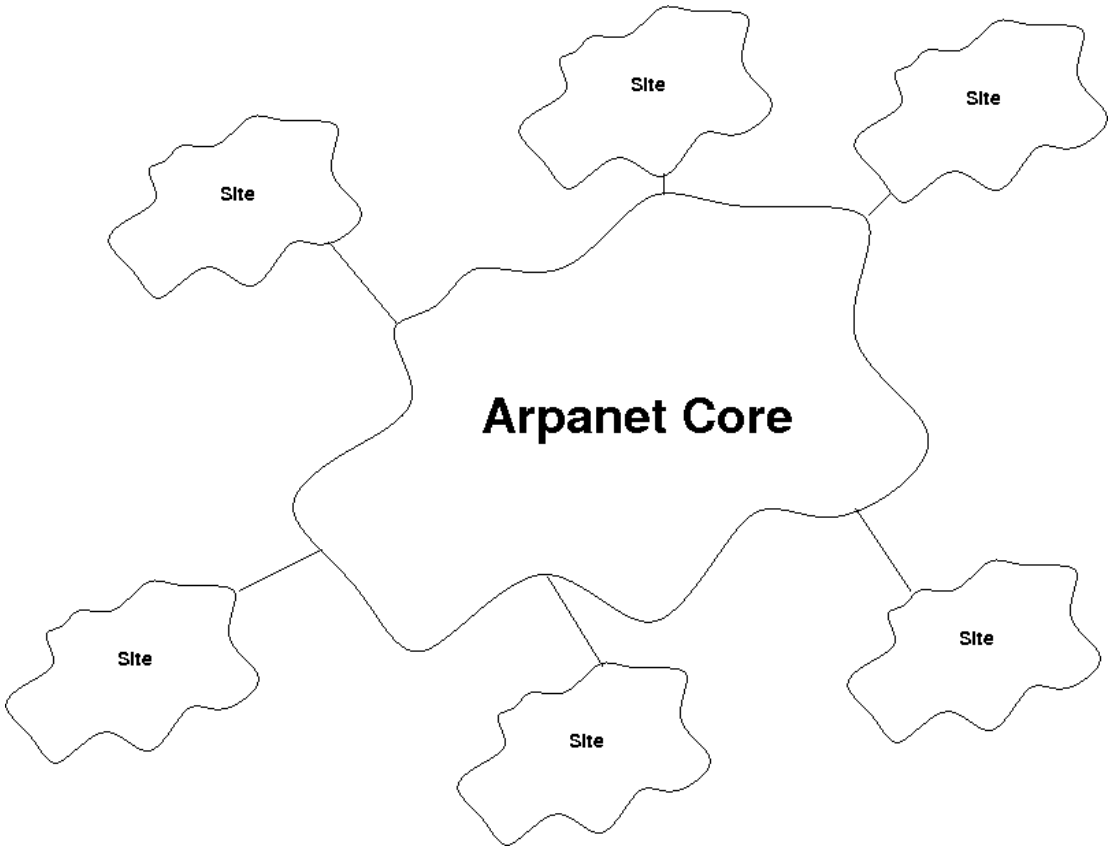
It's an Internet

- The Internet is a "network of networks"
- Packets are routed from network to network
- The networks interconnect
- Who pays?

The Pre-1982 Phone Network

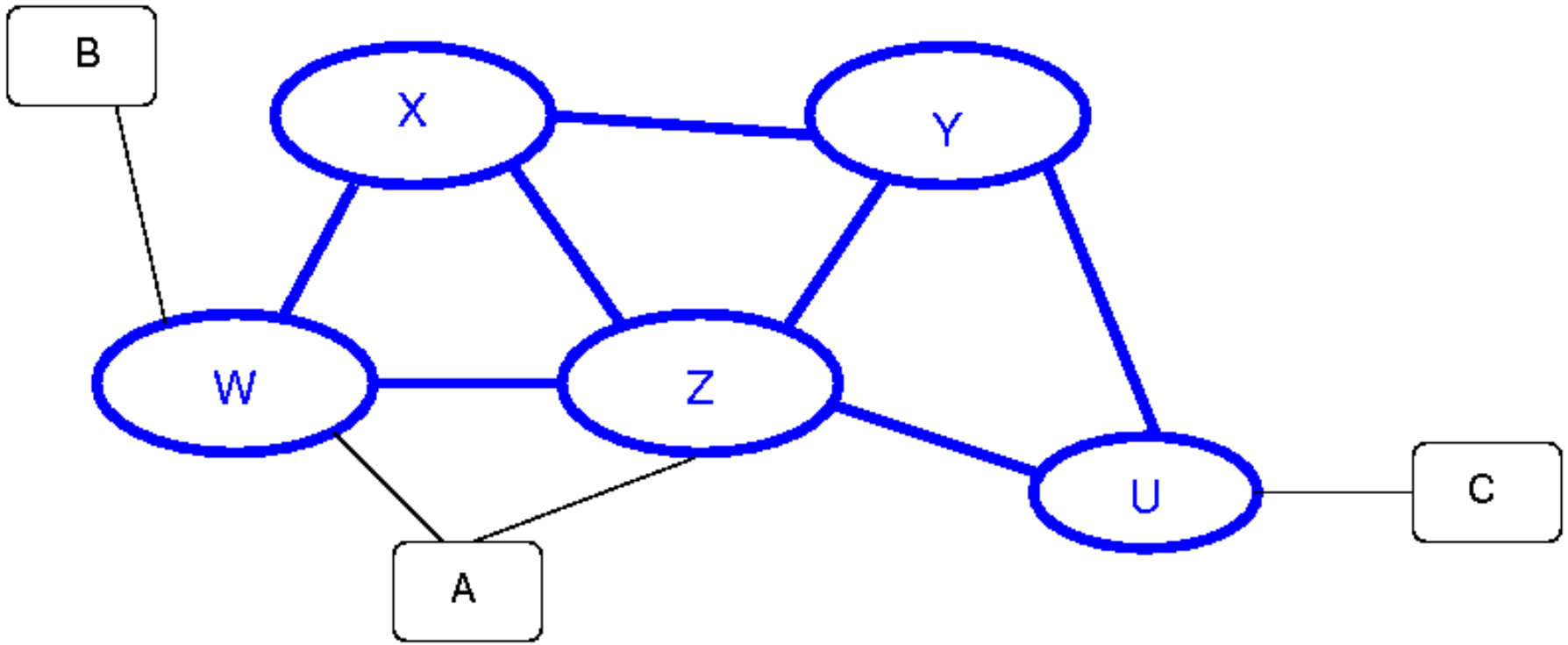
- One major US phone company, AT&T. (In most of the rest of the world, the phone company was part of the PTT (Postal, Telephone, and Telegraph) ministry.)
- Most local phone companies were wholly-owned subsidiaries
- Strictly regulated, including rates and hence rates of return for AT&T
- International connections were arranged government-to-government

The Early ARPANET



It looked the same!

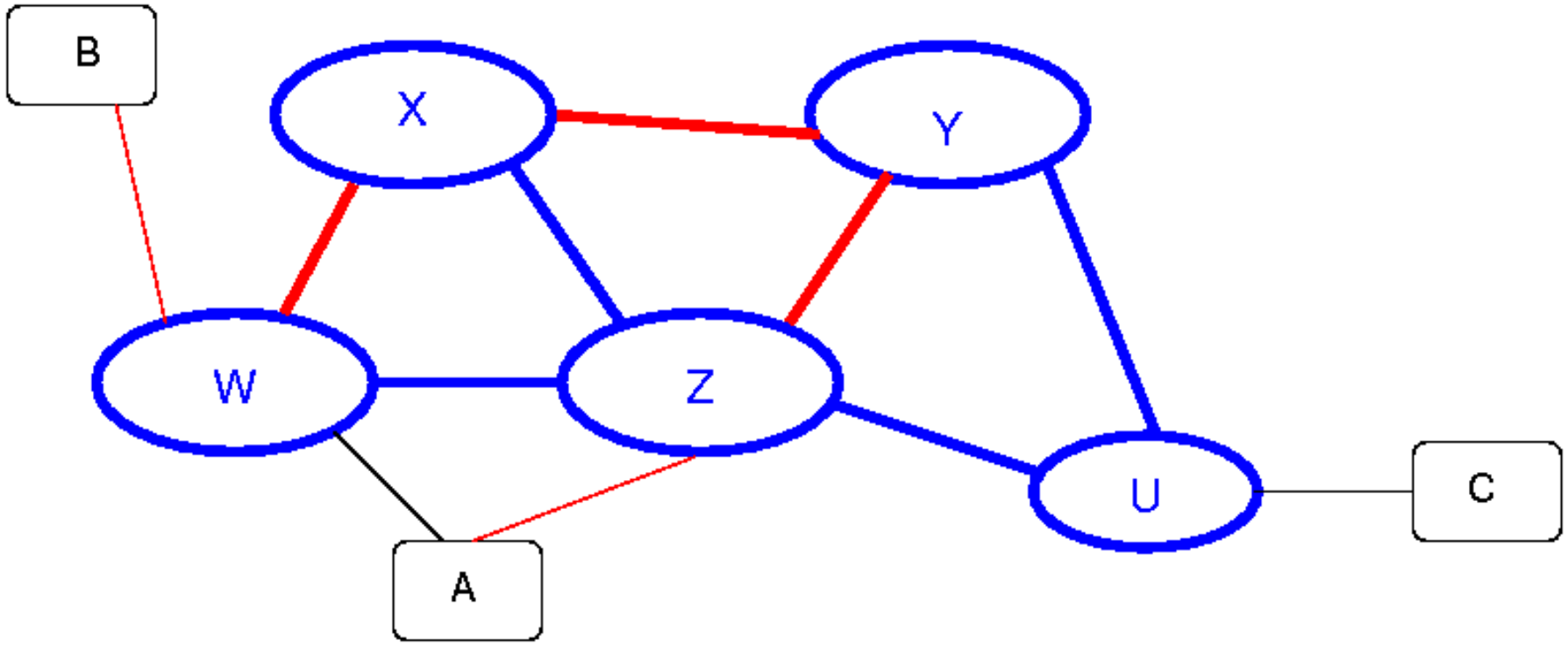
The Internet: ISPs



ISPs in Theory

- They're all alike, and can all talk to each other
- Many interconnect at more than one point
- None are privileged
- They interconnect the way they want
- Many international connections, arranged by the individual ISPs
- A variety of payment schemes, including free interconnection ("peering")
- Why?

Packets' Path Depends on Business Deals



What are Z's contracts with W, X, and Y?

Different Society

- The Internet grew up in a deregulatory era
- Phone companies were being broken up and/or privatized and/or exposed to competition
- More flexibility—and more complexity

Inequality

- Not all ISPs are alike
- The big ones—the “Tier 1” ISPs—don’t pay each other for interconnection
- Most of the Tier 1s are the big phone companies: AT&T, Verizon, Sprint, Qwest, etc.
- Smaller ISPs buy “transit” from the Tier 1s
- In principle, they don’t have to; in practice, they’re not big enough to reach the bulk of the Internet any other way
- Large “eyeball” ISPs (e.g., Comcast, Verizon FIOS) are often in a monopoly position for reaching consumers in their region

Why?

- Again, minimal regulation
- The Internet architeture, both financially and technically, reflects larger societal trends

Societal Consequences

- The rich topology makes it hard to censor Internet traffic
- “The Internet treats censorship as damage and routes around it.”
- Countries that wish more control over content (e.g., China, Iran, Saudi Arabia) have enforced a more centralized architecture internally

Ethical Categories

- Common: apply to everyone
- Project goals
- Profession-specifc knowledge

Common Ethics

- Conflict of interest
- Kickbacks, bribery, etc.
- Software licenses

Important, but we won't spend class time on these—they apply to everyone.

Project Goals

- Is the outcome ethically acceptable?
- Will the result be “good for society”?
- One way to look at it: would you still approve if you were not personally profiting?

Profession-Specific Knowledge

- Only a specialist is likely to be aware of the issue
- Only a specialist is qualified to evaluate the issue
- But everyone can be affected

Focus of Responsiblity

- Your employer

☞ Generally profession-specific issue

- Society as a whole

☞ May be either goal-specific or profession-specialized

A Look at History

- Nuclear weapons
- Recombinant DNA
- Human subjects research
- Yellow fever

Nuclear Weapons: Four Individuals

- Leo Szilard
- J. Robert Oppenheimer
- Werner Heisenberg
- Edward Teller

Which of them acted ethically?

Leo Szilard

- Invented—and patented—the nuclear fission chain reaction (patent GB630726, issued 1936, “Improvements in or Relating to the Transmutation of Chemical Elements”).
- He was well aware that the atomic bomb was one possible use, and sought to keep the patent secret (it wasn’t published until 1949)
- Instigated the famous 1939 Einstein letter to President Roosevelt calling for development of the atomic bomb
- In 1943, attempted to use his patent rights to gain a policy voice for scientists on use of the bomb
- After the war (and partly because of the Bomb), gave up physics and became a biologist

Which of these items were ethically proper?

All of Them?

- The invention was an act of pure science—and the patent was a mechanism to keep it secret, especially from the Nazis
- (Other British scientists felt that patents were unethical because patents generally had profit, rather than knowledge, as their motive.)
- The Einstein letter had two goals: to start U.S. research towards a bomb, and to suggest the desirability of keeping uranium ore away from the Nazis
- He gave up nuclear physics because he felt it had led and would lead to too many immoral consequences

What About a Policy Voice for Scientists?

- Partly inspired by H.G. Wells' book *The Open Conspiracy*
- Wells: "It seemed to me that all over the world intelligent people were waking up to the indignity and absurdity of being endangered, restrained, and impoverished, by a mere uncritical adhesion to traditional governments, traditional ideas of economic life, and traditional forms of behaviour, and that these awaking intelligent people must constitute first a protest and then a creative resistance to the inertia that was stifling and threatening us."
- Are scientists really more qualified to rule?

Should Scientists Rule Society?

- They certainly know more about science
- They don't necessarily know more about economics, law, public policy, . . .
- They don't necessarily have the people skills to get consensus on their (idea of proper) policies

Anthropogenic Global Warning

- Most (qualified) scientists are firmly convinced that it's real
- But what should be done?
- Tax carbon? Direct regulation? Do nothing and assume that the free market will solve the problem?
- These are not questions that climatologists are uniquely qualified to answer
- But—what is their role?

The Bomb

- In 1943, almost no one knew about the bomb's existence or potential. Who should decide policy?
- Szilard had thought harder and further ahead than most (save perhaps Bohr)
- He acted *according to his own moral view*
- Special knowledge does confer special *responsibility*—but it does not imply special *ability*
- Szilard was, arguably, the scientist of his generation most driven by ethics
- For his troubles, he was suspected of being a Communist and his security clearance was yanked—the other reason he switched fields. . .

J. Robert Oppenheimer

- Scientific director of the Manhattan Project; was afraid that Germany would get the bomb first
- “Now I am become Death, the destroyer of words” (Oppenheimer thinking of a line from the *Bhagavad-Gita* after seeing the first A-bomb test.)
- In 1945, when working on bomb target selection, suggested sharing the research with the world, for moral reasons
- Opposed the H-bomb initially, on both technical and moral grounds
- When a new technical approach was devised, he called it “technically sweet” and supported work on it.

Did Oppenheimer Act Ethically?

- In 1942, when he was appointed to head the Manhattan Project, it was hard to argue that any weapon against Nazi Germany was immoral
- It was far less obvious, in mid-1945, that the bomb should be used against Japan without warning. (It is also unclear if there was any chance Japan would have surrendered to anything less than what was done.)
- But why should technical changes affect the morality of using the H-bomb?

A Mixed Bag

- Oppenheimer was a tortured soul, who did agonize over moral and ethical questions
- Too often, though, he seemed to be seduced by other considerations
- Access and power?
- Technical challenges?

Werner Heisenberg

- Nobel Prize-winning physicist
- A major figure in the German A-bomb project
- Met with Bohr in Occupied Denmark—but just why is unclear (Bohr was vehemently anti-Nazi)
- Made a crucial theoretical mistake in calculations, and thus concluded that graphite reactors—the easiest kind to build, especially after the British destroyed the stocks of heavy water in Norway—weren't possible

Amoral, at Best

- He did work on fission for the Nazis
- “He had agreed to sup with the devil, and perhaps he found that there was not a long enough spoon” (expatriate German physicist (and former advisee of Heisenberg) Sir Rudolf Peierls)
- Did he sabotage the graphite calculations?
- Was he seeking help from Bohr or warning the Allies?
- He was diffident when asked directly by Armaments Minister Speer if a bomb was possible
- But he never declined to work on it
- (By contrast, another famous physicist and Nobel laureate, Frédéric Joliot-Curie, was very active in the French Resistance.)

Edward Teller

- A prima donna during the Manhattan Project; he only wanted to work on the "Super" (what later became known as the H-bomb)
- "...blamed at Los Alamos for leading the laboratory, and indeed the whole country, into an adventurous programme on the basis of calculations, which he himself must have known to have been very incomplete." (Bethe)
- Helped strip Oppenheimer of his security clearance, partly because Oppenheimer opposed a (premature) crash program to develop an H-bomb
- Deceived people about the likely success of X-ray lasers in Reagan's anti-missile system (the "Strategic Defense Initiative" (SDI), better known as "Star Wars")

Enough said...

Von Neumann to Ulam: Icicles are Forming

Recombinant DNA

- In 1974, biologists called for a moratorium on research on recombinant DNA until the safety of such research could be assessed, and perhaps better procedures devised
- Most scientists around the world went along
- This sort of self-restraint—not investigating potentially interesting and useful new science—was all but unprecedented
- A meeting was held at Asilomar to come up with a consensus

The Asilomar Conference

- Match restrictions to perceived risk
- Use a combination of procedures (i.e., limited access, no mouth-pipetting), physical controls (hoods, negative pressure, air locks), and biological controls (hosts that can't live outside the lab)
- Concluded that soome experiments should not be done at all

Human Subject Experimentation

- Formal restrictions on experimentation on humans without prior review by an ethics board ("Institutional Review Board" (IRB))
- Immediate trigger: the Tuskegee syphillis experiment
- Applies to virtually all human subject experiments, even something as simple as questionnaires
- IRBs must include scientists and non-scientists, men and women, people familiar with particularly vulnerable target populations such as prisoners

The Tuskegee Syphillis Experiment

- 600 African-Americans (399 with syphillis, 201 without) were studied and tracked, starting in 1932
- None were ever offered treatment for syphillis, even after penicillin became available
- (The pre-penicillin treatment, neosalvarsan (an organoarsenic compound) wasn't that effective and was rather toxic besides)
- Local doctors, white and African-American, were told not to treat the subjects
- The study was supposed to last six months; it lasted 40 years
- Arguably, it was ethical in 1932, since there were no effective treatments then—but it continued long after treatment was available
- Even so, the target population selection was racially biased

Walter Reed and Yellow Fever

- Major Walter Reed was in Cuba, investigating how yellow fever was transmitted
- He concluded that human experimentation would be necessary to settle the issue
- Some of the investigators experimented on theselves—and one died
- Other experiments used volunteers—but were they genuine? They were well-paid (`http://virtualmentor.ama-assn.org/2009/04/mhst1-0904.html`)
- Did they really give informed consent?
- They probably did a good job by the standards of the day

Good Intentions; Bad Results?

"Knowledge," Niels Bohr once noted, "is itself the basis for civilization." You cannot have the one without the other; the one depends upon the other. Nor can you have only benevolent knowledge; the scientific method does't filter for benevolence. Knowledge has consequences, not always intended, not always comfortable, not always welcome. The earth revolves around the sun, not the sun around the earth. "It is a profound and necessary truth," Robert Oppenheimer would say, "that the deep things in science are not found because they are useful; they are found because it was possible to find them."

Richard Rhodes. *The Making of the Atomic Bomb*

Approaching Ethical Issues

- What are the implications of your actions?
- Who might be affected?
- Do others with no stake in the activities agree that your actions are ethical?

Making a Choice

- There is no perfect foresight
- Even honest, honorable people can disagree about what is ethical in a given situation
- That said, there are some things that are never acceptable
- Matters are more complex when dealing with technical questions—technical issues are often conflated with moral and/or political views (i.e., should the H-bomb have been developed before the Ulam-Teller design made it clearly feasible?)
- But—you have to *think hard* about such questions