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CRITICAL INFRASTRUCTURE PROTECTION PROJECT

Critical Infrastructure Protection Project

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CIPP Foundations

1. The CIP Project will deliver a set of high quality products that solve specific problems of critical infrastructure protection

2. The CIP Project's research will be academic and tailored to the needs of policymakers and critical infrastructure owners and operators and tied to the national critical infrastructure agenda

3. The CIP Project's comparative advantage is to combine technological solutions with legal and policy solutions

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Criticality of technical standards

- Standards are the basic mechanism for producing security, safety, and privacy.
- Cybersecurity standards are not being deployed fast enough or comprehensively enough.

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Drivers for standards

- What are the ultimate drivers of standards deployment and enforcement?
- Example: The recent nightclub fire in Rhode Island
- Various standards are supposed to prevent this type of accident and do reduce the risk of it.
- Examples:
  - Building codes;
  - Fire codes (capacity limits, egress standards, etc.);
  - Product flammability standards;
  - Insurance standards;
  - Civil liability (tort) standards.

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Cybersecurity is similar to fire

- Everyone's safety depends not only on what precautions they use but also—importantly—on what precautions other people are using.
- Potential for cascading failures.
- Potential for mass disasters, both physical and economic.

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Collective action problem

- Everyone wants the other person to be using precaution, but no one wants to incur the cost him or herself
- When one California homeowner installs (expensive) fire resistant roofing tile, the whole neighborhood becomes safer.
- Similarly, when one computer owner on a network complies with better (but more costly) security standards, the whole network becomes safer.
- Corollary: How to incentivize privately maximizing individuals and firms to serve the common good?

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Cybersecurity won't be solved by neighborliness and good manners

- Cybersecurity is costly, and too many of the costs are external to the private investor, though internal to the network as a whole.
- Our market system is not designed to focus companies' attention on good investments they can make to benefit competitors.
- How can we get Bank X to make a $1000 security investment that will yield a $100 benefit to itself and a $100 benefit to each of 20 other banks?

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Solution set for similar problems

- Government regulation.
- Insurance regulation.
- Ownership regulation (single-proprietor networks, e.g., Visa).
- Tort liability regulation.
- Contract regulation.
- Association regulation.

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Each solution uses standards

- No government regulation without standards;
- No insurance regulation without standards;
- No tort liability regulation without standards;
- Etc., etc.

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Each solution has problems

- Historically, problems of this same type have taken years to solve.
- E.g., mass city fires; steam boiler explosions; highway traffic safety; clean air, clean water, etc.
- No individual solution is perfect.
- Ultimate social response to cybersecurity will be mixed strategy of different types of solutions (those presented here and maybe some not here).

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Problems common to all solutions

- Cybersecurity is "joint-care" problem like problem of clean air or highway traffic safety.
- Tens of—even hundreds of—differently situated actors must use different precautions and must anticipate others' lapses. E.g., software sellers, ISPs, backbone service providers, mainframe owners, physical installation owners, etc.
- Because IT is so dynamic, cost and comparative advantage can change rapidly, altering who should do what to reduce risk at reasonable social cost.
- Using national sovereignty and jurisdiction to solve problem without borders.

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Government regulation problems

- Need multiple standards for differently situated actors (software sellers vs. Internet service providers).
- Government must solve "information problem" (who can do what at least cost in a technologically dynamic setting).
- Massive enforcement problem (similar to IRS and environmental protection).
- Serious privacy problems.

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Insurance regulation problems

- Standards for insurance coverage do not always exist. (What is the cyber-equivalent of fire-resistant roofing tile?)
- Lack of historical actuarial data.
- Insurance function breaks down with cascading failures and correlated losses ("cyber-hurricane").

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Ownership regulation problems

- If one person or company owned all the world's IT, there would be no collective action problem (though there would still be a need for standards).
- Monopoly problem.
- Diseconomies of scale.
- Diseconomies of scope.

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Tort liability regulation

- Tort liability sometimes creates disincentives to new standards.
- Plaintiffs' lawyers can't prove you were in breach of standard if standard does not exist.
- Little tort liability for purely economic losses.
- Duty and proximate cause limitations.
- National sovereignty and jurisdictional issues.

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Contract regulation problems

- Web of reciprocal contracts for each connecting member to use precaution for safety of network.
- Process would require standards.
- Same enforcement problem as for government regulation.
- Depends on national sovereignty and jurisdiction.

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Association regulation

- Model would be homeowners' association.
- Promulgates or adopts already-established technical standards.
- Declares penalty structure or obligations to certify compliance.
- Association management perform some enforcement functions in tandem with public enforcement (maybe similar to SEC model).

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Association regulation problems

- Does not depend as much on national sovereignty and jurisdiction.
- Monopoly and antitrust problems.
- Enforcement problem (ostracism may not be enough).
- Might solve information problem better than more centralized organizations.

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