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Challenges to the Deployment of Internet Security Enhancements

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The opinions expressed are my own, and do not necessarily reflect
the views of the FCC or the U.S. Government.

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Webbed, Wired and Worried

“ ... at least some of their libertarian, technology-will-solve-everything cockiness was gone. I found a much keener awareness that the unique web of technologies Silicon Valley was building before 9/11 - from the Internet to powerful encryption software - can be incredible force multipliers for individuals and small groups to do both good and evil. And I found acknowledgment that all those technologies had been built with a high degree of trust as to how they would be used, and that that trust had been shaken.”

Thomas L. Friedman, NY Times, May 26, 2002

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Thought Questions

- Are market incentives alone sufficient to ensure that all “necessary” enhancements to Internet security infrastructure will be deployed?
- If not, is it possible to identify and prioritize the set of security features that are unlikely to be deployed without “help”?
- What public policy measures are available to foster deployment of those security features?
- What are the costs and benefits of those measures?
- What are the prospects that they will be effective?

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Examples of a Glacial Pace of Deployment

- DNS security enhancements
- BGP-4 security enhancements
- IPv6 (tangentially relevant to security)

See *The National Strategy to Secure Cyberspace*, February, 2003

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Technology Drivers vs Business Drivers

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- Technology
 - mature standards
 - stable implementations
 - industry consensus where necessary
- Business drivers
 - perceived tangible benefits
 - predictable costs
 - favorable cost/benefits ratio
 - payback within a reasonable time horizon

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Market Forces

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- Incentives
 - Sufficiency
 - Alignment - Who pays? Who benefits?
 - Quantifiability
 - Time frame over which benefits are generated
- The economics of network externalities
- Transaction costs and the end-to-end principle

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Incentives

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- Who pays?
 - The service provider?
 - Ultimately, the customer?
 - The Government?
- Who benefits?
 - The service provider?
 - Society at large?
 - How can the benefits be quantified?
- In what time frame?
 - Financial markets have short horizons.
 - Difficult to insure against a “30 year flood”.
 - “Après moi, le déluge!”

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Network Externalities

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- Some features are worth more as more providers deploy them. Nothing succeeds like success.
- The societally optimal value is not necessarily where the market would settle without “help”.
- Examples:
 - telephone - Universal Service
 - VCRs - widespread deployment for time shifting antedated the emergence of a rental industry
 - CD players - vertical integration with recording studios
 - black and white TV - industry and government standards
- The decision to deploy is much more difficult for the first service providers to deploy such solutions.

Cf. Rohlffs, *Bandwagon Effects in High-Technology Industries*, 2001.

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The End-to-End Principle

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- A guiding principle of Internet architecture.
- Certain features are best implemented, not in the network, but in the end systems that implement the application. It is counterproductive for the network to also provide those same features.
- It is easy to incorporate new innovations at the Application Layer (e.g. the WorldWide Web).
- Innovations that are *not* end-to-end are harder.
 - Requirements for interoperability and upward compatibility.
 - Limited value until ubiquitously available.
 - Many participants -> high transaction costs.

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Public Policy Considerations

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- **Balance**
 - What are the risks of action?
 - What are the risks of inaction?
- **Minimalism**
 - What is the least intrusive intervention that will achieve the desired public policy objective?
 - “That government is best which governs least.” - Thoreau

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Public Policy Alternatives

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- Help industry to coalesce consensus.
- Collect relevant data and statistics.
- Provide “seed money” for research and for interoperability testing.
- Support secure services through the purchasing preferences of the U.S. Government.
- Provide remedies (e.g. under tort law) where firms fail to achieve a recognized standard of care.*
- Fund the deployment of desired services.
- Mandate the deployment of desired services.

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* - Critical Information Infrastructure Protection and the Law, National Academies, 2003

Helping to Coalesce Industry Consensus

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- Support sharing of information on best practices, while protecting sensitive information.
- Mitigate antitrust concerns when competitors discuss joint actions that are not anticompetitive.
- Stimulate standards bodies to focus on relevant problems.

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Impediments to Information Sharing

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- Antitrust concerns
- FOIA concerns
 - Need for predictability and certainty
 - Perception versus reality
 - DHS enabling legislation
- State sunshine laws

Cf. Critical Information Infrastructure Protection and the Law; National Academies, 2003

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Sobering Case Studies

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- Government OSI Protocol (GOSIP) - the purchasing power of the U.S. Government and of governments worldwide was insufficient to drive global adoption of OSI protocols. TCP/IP won out, largely due to network externality advantages.
- Metric conversion - A similar story. The U.S. Government has been officially committed to metric since the Seventies. Progress has been glacial.
- CALEA (lawful intercept) - Funding and a mandate are achieving mixed results.

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