Internet Security – Stakeholders, Issues, and Examples

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Outline

- Goals in internetwork security and service assurance
- Five stakeholder classes
- Illustrative Examples
  - Using Secure Socket Layer (SSL) to protect a TCP session
  - Using multiple security technologies to support telecommuting
- Paradoxes in network security for the next generation

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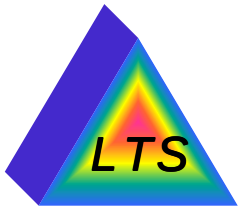
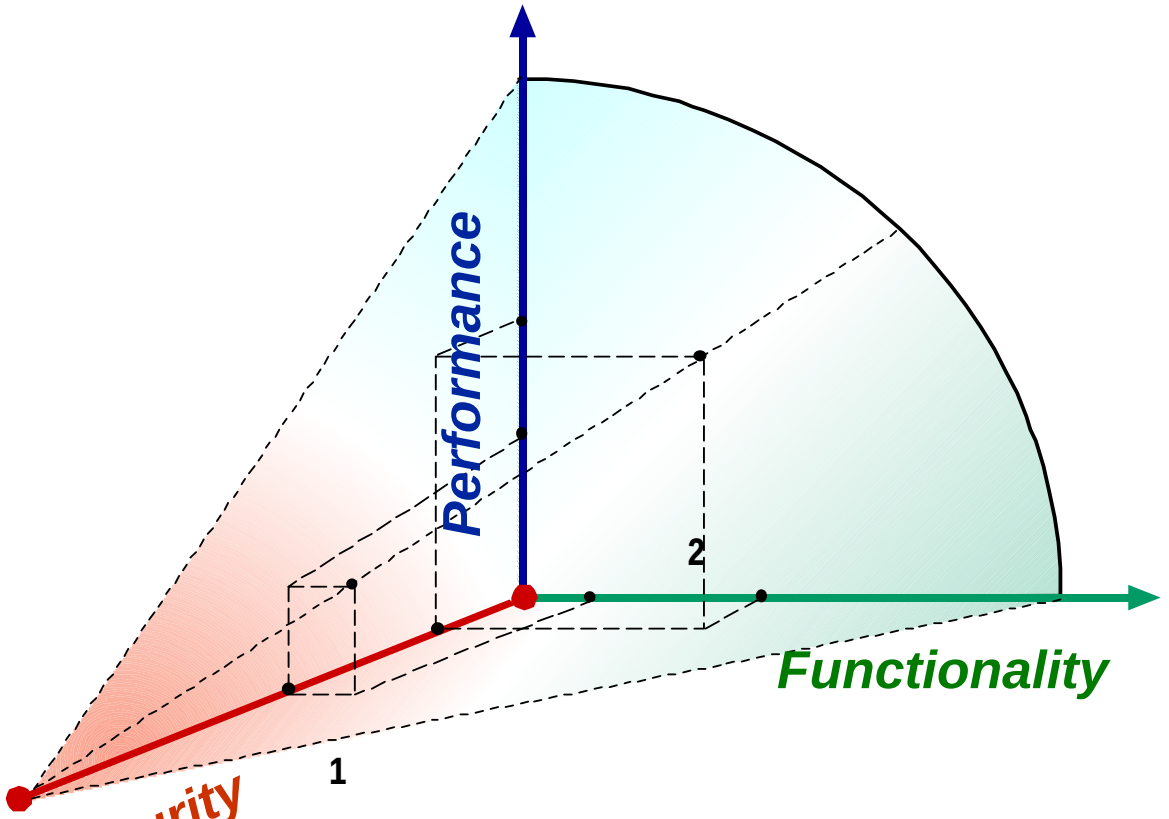


The Information Assurance Challenge



Confidentiality, Integrity, and Availability

Sami Saydjari, DARPA Information Assurance Program, January 2001

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Five Network Security Stakeholder Classes

- Engineering
  - Applying what we know how to do in network security
  - Scaling it up to global dimensions
- Research
  - Exploring what we don't know how to do in network security
  - Finding the the science amidst the issues
- Education
  - Building a basis of network security professionals
  - Finding fresh ideas and documenting old failures
- Business
  - Selling the next thing we learn how to do in network security
- Law and Public Policy
  - Distributing the network security burdens and resources

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Engineering

- Enterprise Firewalls
- Secure Web Servers and Services
- Virus Checkers
- Intrusion Detection
- Anomaly Detection
- Authentication, Authorization, and Accounting
- Virtual Private Networking
- Insider Misuse Detection
- Cryptographic Transforms and Certificates

- Scaling up to larger infrastructures
- Reducing event response times

Much of Security Engineering consists of "check box" deployment of functions and services deemed appropriate to corporate Best Practices.

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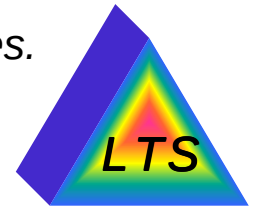
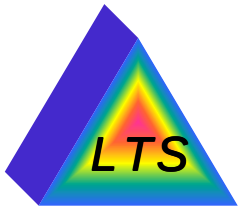


Research – Enduring Hard Topics

- Composition – assembling low assurance components into high assurance systems
- Dynamic Coalition of separately administered networks and software systems
- Dynamic policies which adapt to a changing environment
- Network perimeter mapping
- Integrated software quality control with global outsourcing of development
- Information Filters and Enclave Boundary Controllers
- Large network recovery – what to do with a network 50% degraded?
- Global network forensics and supporting legal processes
- Matching access controls to legitimate workflows
- Metrics of success, vulnerability, and return on investment



Education

- Finding fresh ideas without rediscovering old poorly documented failings
- Founding the science and methodology of network security
- We have good cryptographic capabilities, where is the rest of our practice?
- Extension of computer security science from Unix workstations to embedded global communications systems.
- Building the aggregate knowledge base of defenses and hacks.
- Integrating network security and service assurance into business management curricula
- Integrating network security and service assurance into international law and public policy curricula

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Business

- Where is the return on investment for network security?
- How do we shift liability for insecure systems away from our enterprise?
- Where is the actuarial data for cyber insurance?
- If you grow fast enough, you may self-insure more cheaply than secure – even become too big to fail

- Securing the Network adds cost
- Security delays limit market entry
- Many new worries, little new funding
- Many business failures, few due to faulty security

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Law and Public Policy

- What is the distribution of responsibility and liability in a global network?
- What responsibilities would ~6 dominant global communications service providers and ~200 national governments owe one another?
- Does network security come under contract/tort law, Common Carrier regulation, or international treaties?
- What are the transitive liabilities of Universities and enterprises used as Denial of Service Zombies and attack amplifiers?

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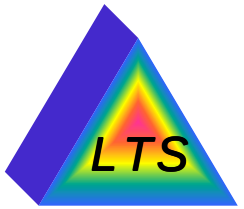

Some Classes of Adversary

- Fraud
  - Seeks money
- Hacktivist
  - Seeks publicity and demonstration of vulnerability
- Recreational Cracker
  - Seeks superiority and challenge
- Internal Misuse
  - Seeks anything from Web surfing on company time to malicious attack
- National and transnational attack
  - Seeks Demonstration of strength, paralysis of infrastructure, …

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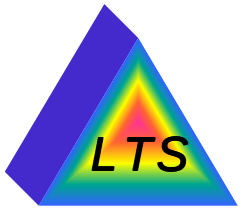
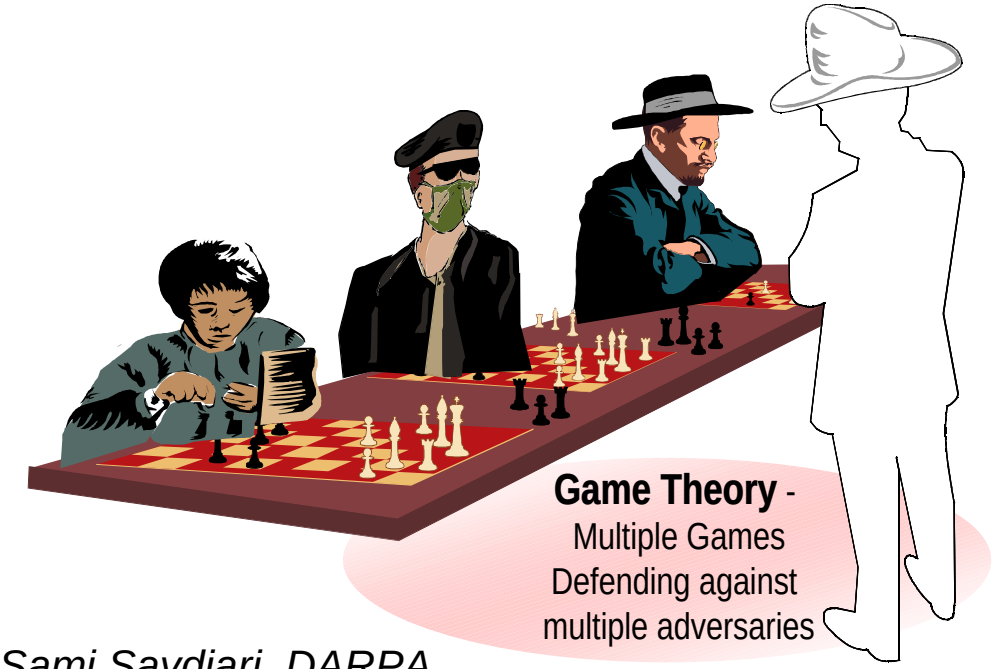


One Defense Against Multiple Adversaries



Sami Saydjari, DARPA Information Assurance Program, January 2001

The defender gets one set of pieces to defend against multiple diverse threats.

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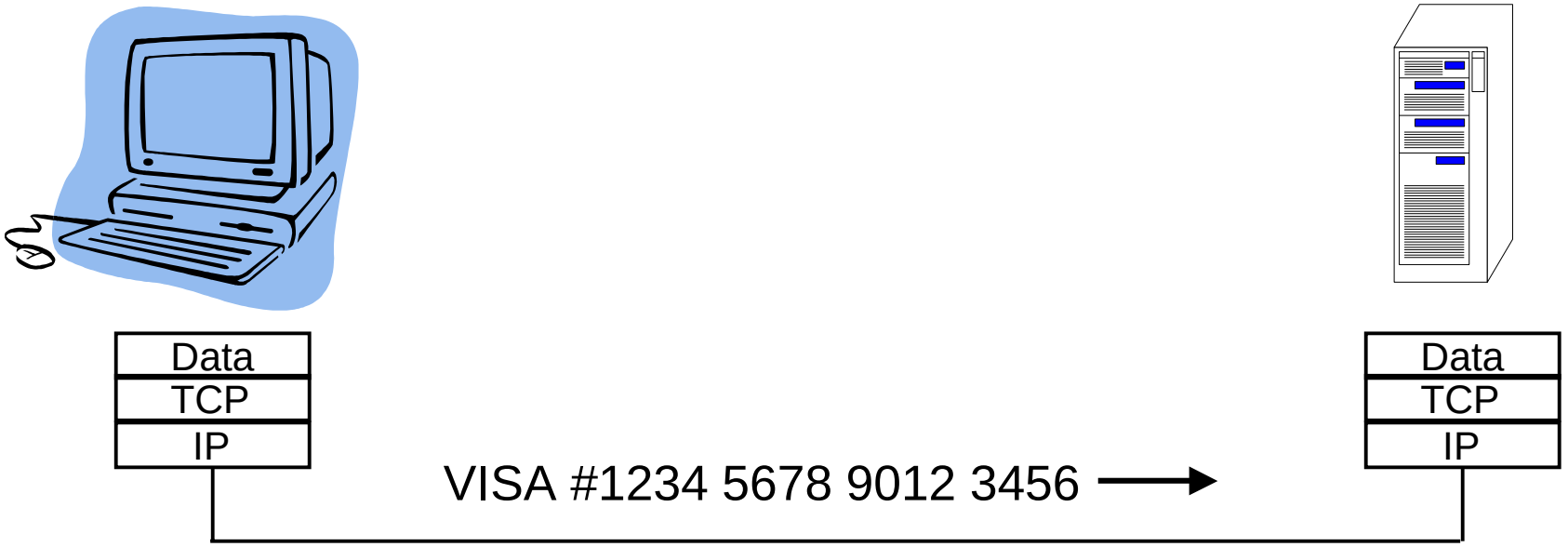
Example – SSL Web Commerce



An HTTP Insecure Web Session

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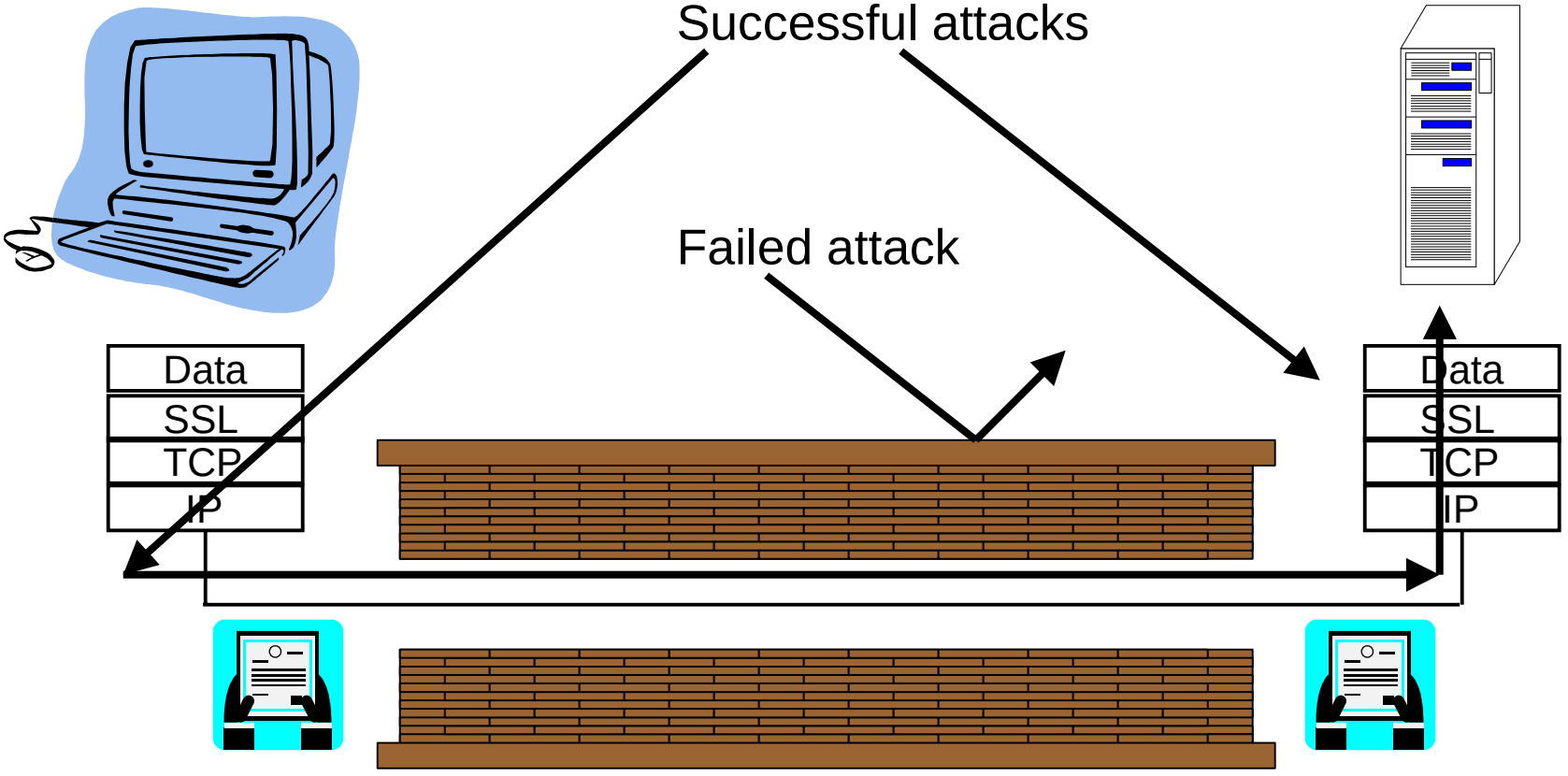
Example – SSL Web Commerce



An HTTPS Secure Web Session

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Example – Telecommuting over a VPN

- The Scenario
  - Government mandates an emergency transition from automotive commuting to telecommuting – how do Commercial, Educational, and Government agencies extend secure Virtual Private Networks to residences, enterprise hotels, and regional access points?
  - Consider a residence with two ex-commuting employees and two children sharing a single wireless LAN
    - Map out the VPN protocols needed to keep commerce running

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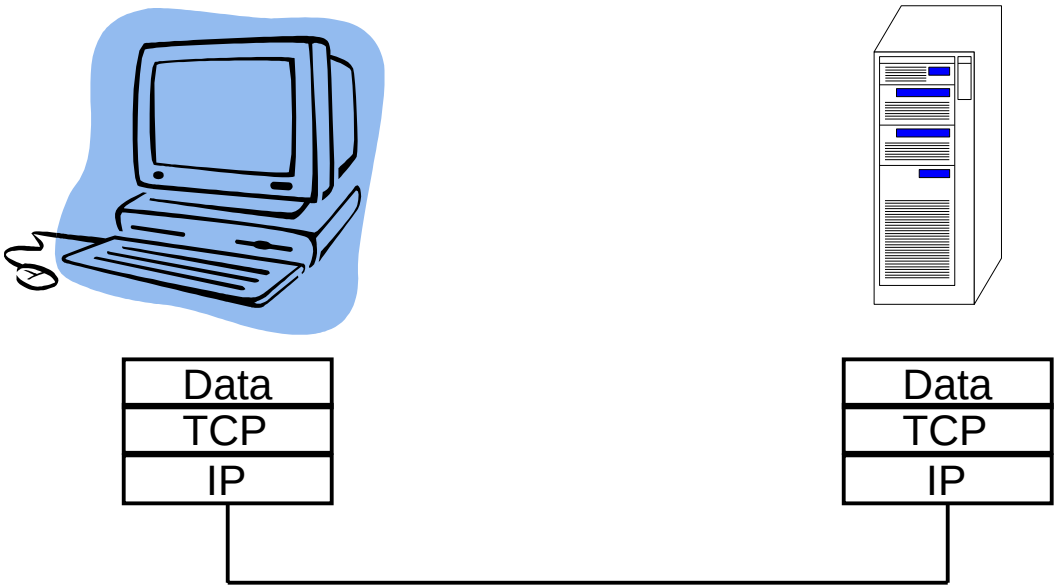
Telnet without Added Security
appropriate to an Enterprise Intranet



A user keystroke is sent to a server

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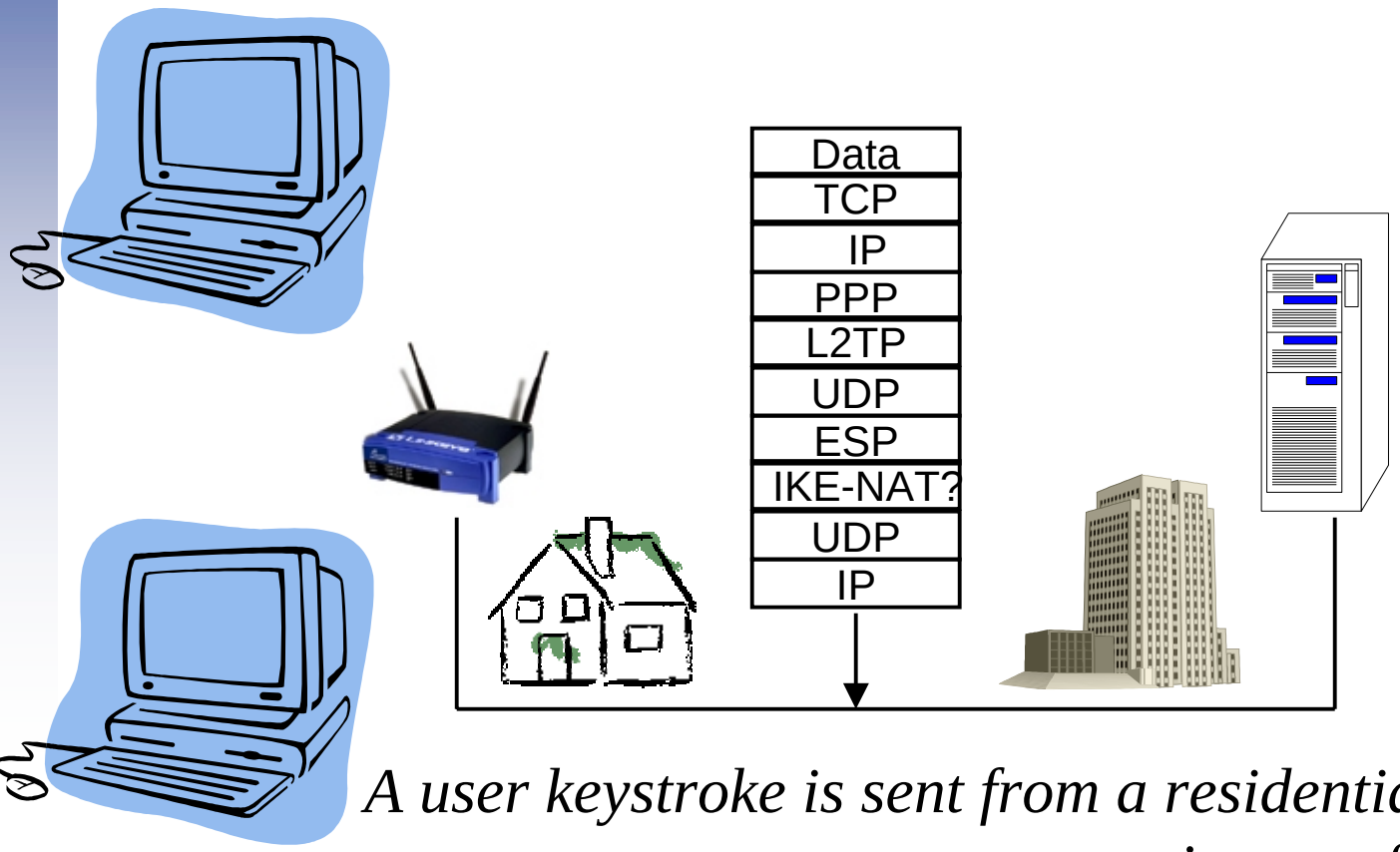
Telnet with VPN Security



A user keystroke is sent from a residential computer to a corporate server in one of several possible VPN layerings

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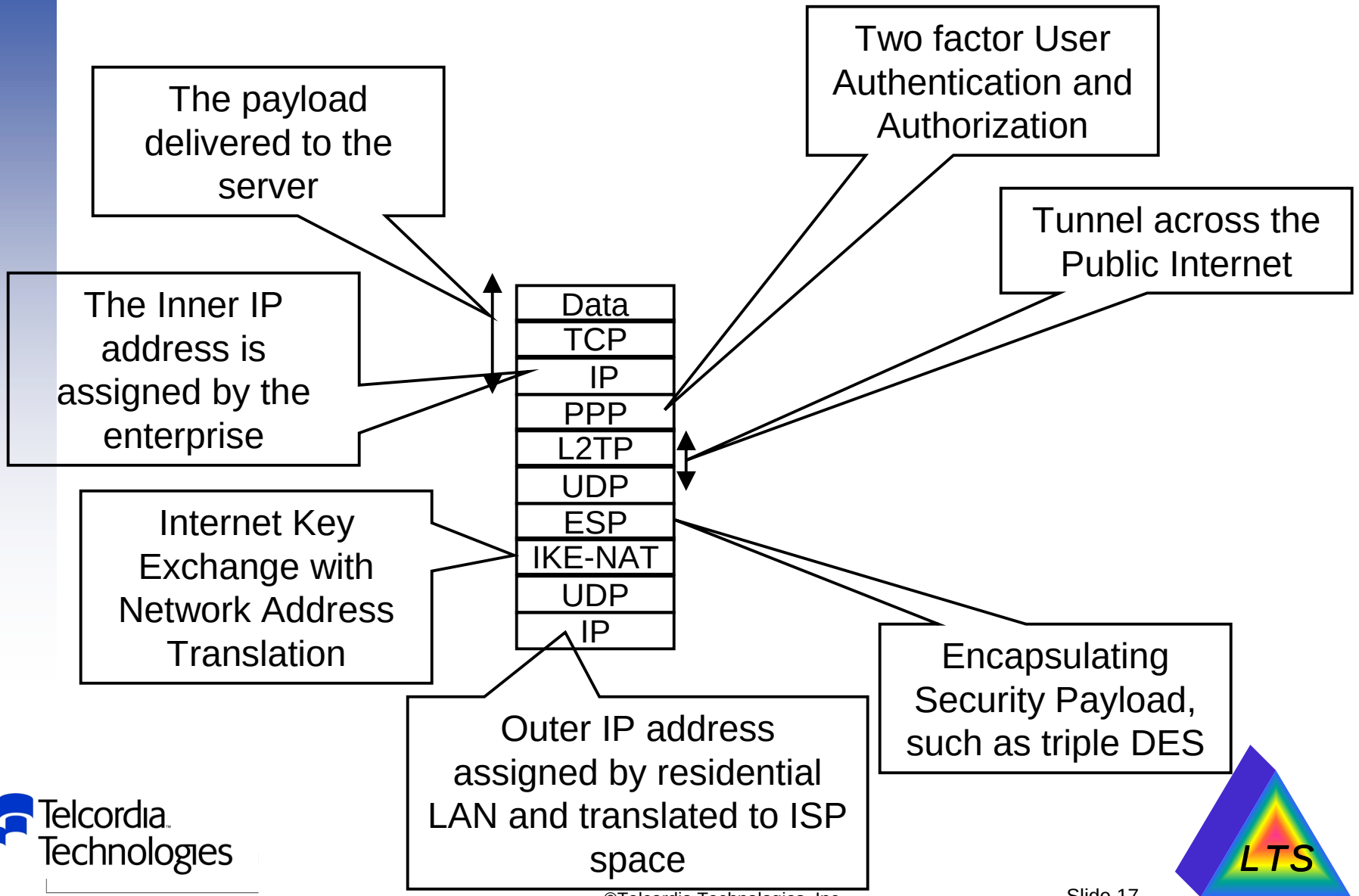
Security Layering



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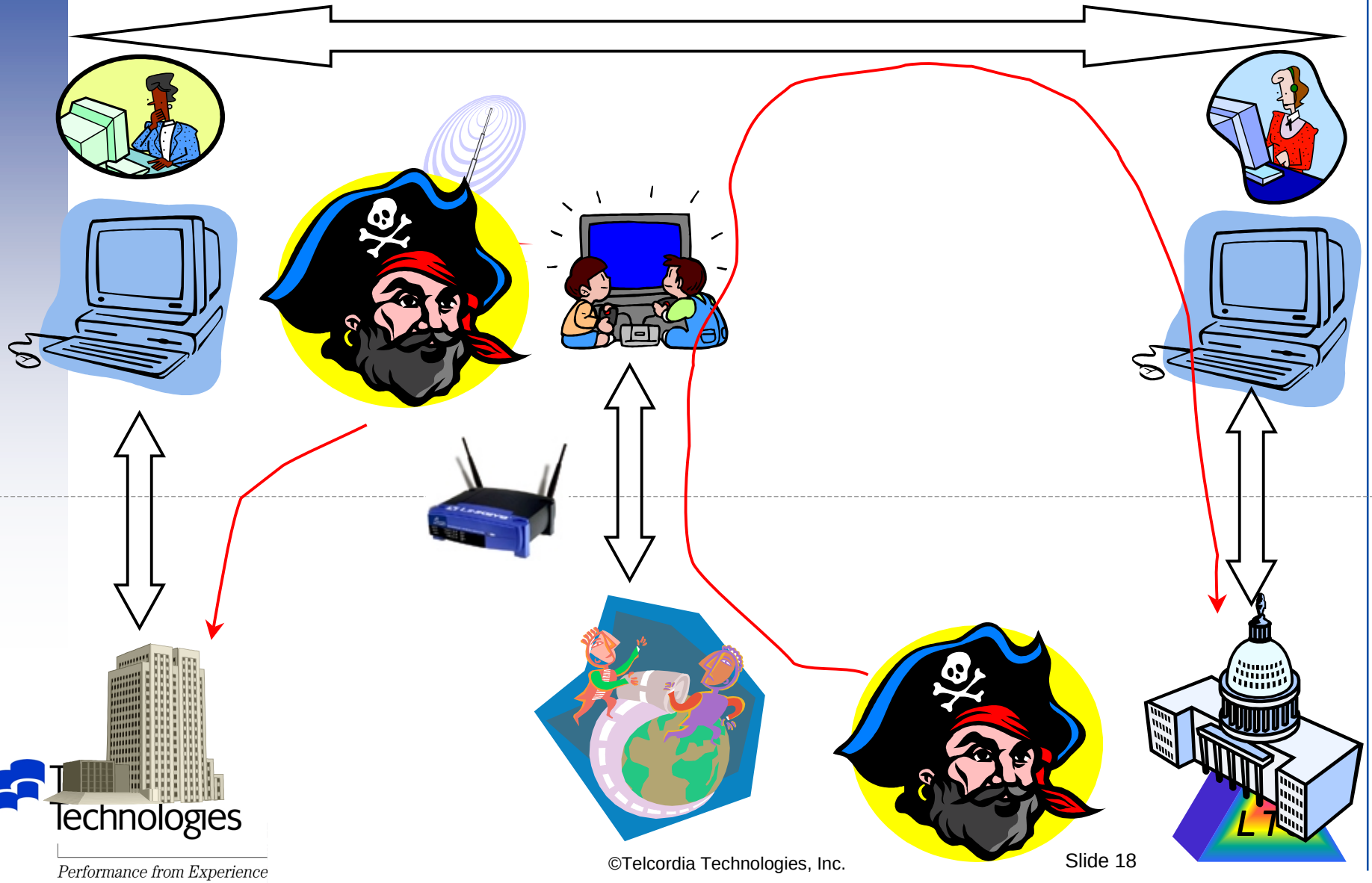
Sharing the Telecommuters' Residential Wireless LAN



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A Cable Modem Service Agreement

i. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, THE SERVICE IS FOR PERSONAL AND NON-COMMERCIAL USE ONLY AND CUSTOMER AGREES NOT TO USE THE SERVICE FOR OPERATION AS AN INTERNET SERVICE PROVIDER, A SERVER SITE FOR FTP, TELNET, RLOGIN, E-MAIL HOSTING, "WEB HOSTING" OR OTHER SIMILAR APPLICATIONS, FOR ANY BUSINESS ENTERPRISE, **OR AS AN END-POINT ON A NON-[Service provider] LOCAL AREA NETWORK OR WIDE AREA NETWORK, OR IN CONJUNCTION WITH A VPN (VIRTUAL PRIVATE NETWORK) OR A VPN TUNNELING PROTOCOL;**

Added security may be a contract violation without paying your ISP an increased fee!

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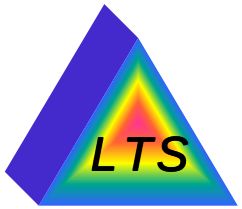

Assurance Paradoxes to Refute

- Any given incremental defender's effort can be bypassed by a smaller adversary effort
- Any comprehensive network is too complex for a single defender to partition, map, or systematically protect
- The incremental deployment of 3-DES adds unauditable connectivity which decreases security
- Anomaly detection gear is, for some threats, provably worse than random guessing
- For a corporation to discuss a network security problem in public is to become liable for its solution
- The "Denial of Service Server" – new security solutions are attractive and fragile targets

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