

Autonomous Network Management

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MITRE Sponsored Research

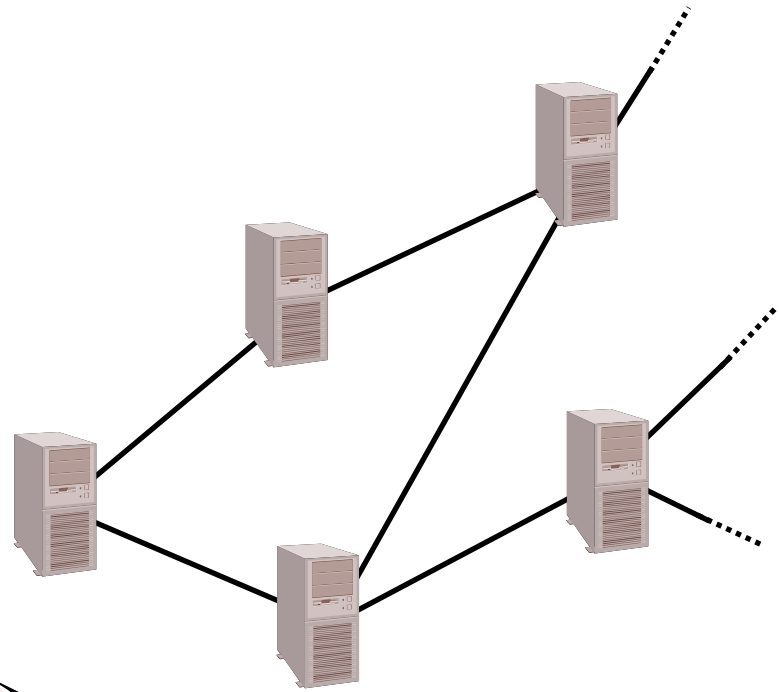
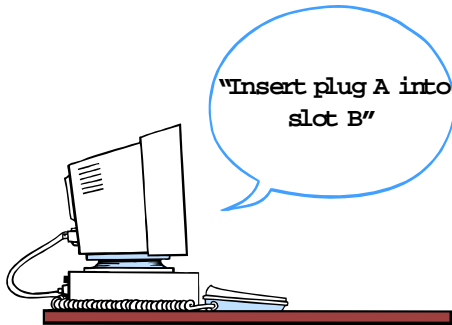
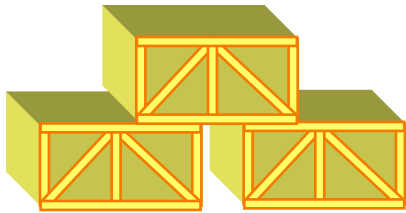
The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue to the left of the text.

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Problem

- **The military has a need to rapidly deploy and configure IPv4 networks for communications and support of mission critical applications.**
- **Today's methods for configuring and maintaining networks are slow, manual, and error prone, requiring highly trained personnel.**
- **Rapid network deployment by untrained personnel may produce an inefficient network topology.**

Background



Objective

- **Create a protocol to automate router and host setup, discover new links and networks**
 - Cannot disrupt the existing network
 - Efficient use of the IP address space
 - Route aggregation
 - Minimal protocol overhead
- **Develop an “Adviser” software program that will assist building and maintaining the network**
 - User inputs the newly available devices
 - Adviser program collects information from the network and determines possible solutions
 - Adviser program produces a “cut sheet” with a step-by-step list of actions to take

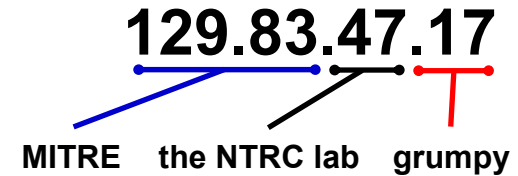
Activities

- **Research and explore possible schemes**
- **Verify network merging scheme with test network**
- **Implement automatic network discovery and address deconfliction**
- **Gather network topology and traffic flow.**
- **Analyze the network and suggest topology changes to reduce network delay and increase the minimum cut set**

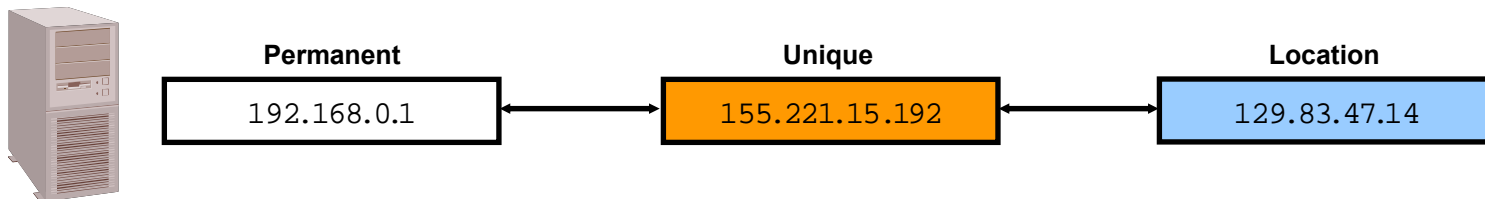
Highlight

IP addresses contain two properties:

- Uniqueness
- Location



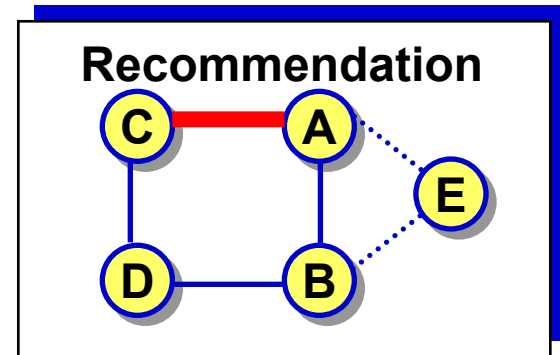
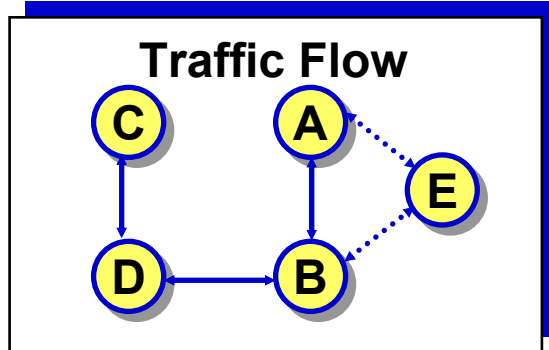
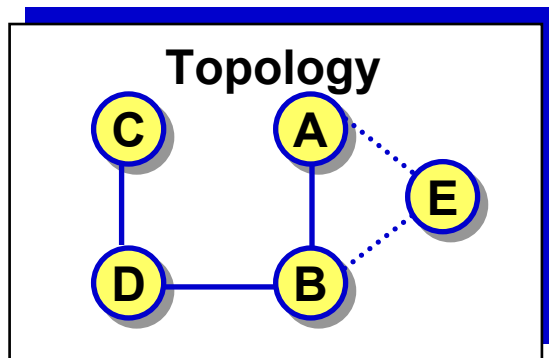
We've extracted these properties from an IP address enabling us to freely change addresses without disrupting network connections. Packets are addressed to the Unique address and tunneled through the network using the Location address.



Allows us to ensure uniqueness and route aggregation when configuring networks.

Highlight

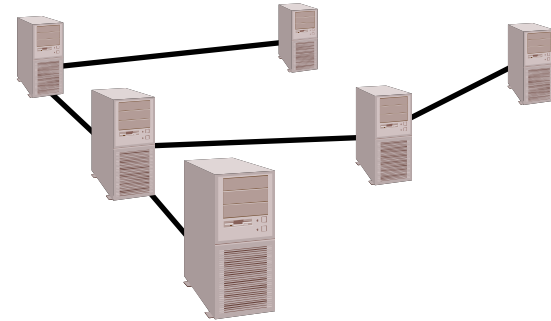
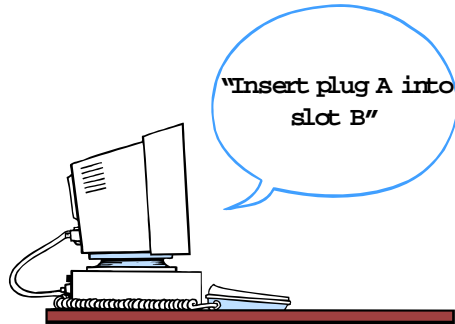
- Adviser gathers network topology and traffic flow, analyzes the data and recommends improvements



Impacts

- **Enable networks to be constructed and managed by untrained personnel**
- **Simplify network evolution**
- **Improve utilization of existing resources**
- **Meet the military's need for rapid deployment**

Demonstration



- Adviser collects network topology and traffic flow.
- User requests location to add new link.
- Adviser analyzes the network and recommends the best locations for adding the new link.