

Problem Statement

- Networks are difficult to configure
 - Thousands of lines of configuration commands
 - Functionality distributed across many devices
 - Many different protocols and standards to configure
 - Manual and time-consuming
- Difficult to design suitable tools
 - Limited knowledge of how networks are configured
 - Limited understanding of how operators interact with the network

Objective

- Understand properties of configuration changes
 - How the network changes over time
 - How the operators interact with different devices
- Use observations to motivate the design of new tools

Data and Observations

- Archived configuration files from 2 enterprises
 - 5 years worth of configuration changes
 - Campus 1: 28 routers, 416 firewalls and 1316 switches
 - Campus 2: 51 routers, 1248 switches, 347 firewalls

Future Work

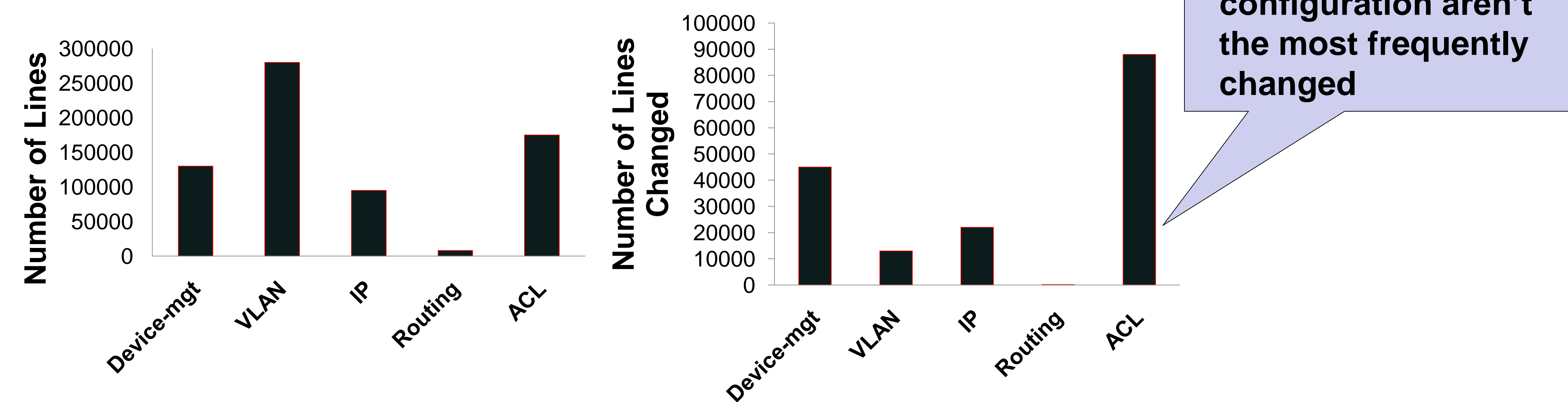
- Automating configuration management
 - Utilize observations to generate
 - Automatically create configuration templates
 - Automatically detect common misconfiguration
- Synthesizing configuration from a high-level language
 - Develop high-level policy language
 - Design algorithms to create low-level configuration commands

Commonly Performed Tasks

A small number of tasks account for most changes in the network

Frequently Configuration Changed	Goal	Percent Of changes
Interface, Routing Protocol	Adding a Department	60%
Interface, Routing, Prefix-list (control plane filter)	Adding a Department with security controls	10%
ACL (data plane filter), Interface, Routing Protocol	Adding a Department with security controls	6%
Route-map, Prefix-list	Changing Control plane	5%
Interface, Prefix-list (control plane filter)	Changing the address for a department	4%

Configuration Changes



Operation Change Pattern

