Seattle ITS Resiliency Project

ITS Washington
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Seattle Department of Transportation

Our mission, vision, and core values

Mission: deliver a high-quality transportation system for Seattle

Vision: connected people, places, and products

Committed to 5 core values to create a city that is:

- Safe
- Interconnected
- Affordable
- Vibrant
- Innovative

For all

Brief History of ITS in Seattle

- We operate out of the 37th floor of a downtown high-rise
- The Transportation Operations Center is adjacent to a server room where the ITS applications were previously hosted
- Originating from that room is the fiber-optic and copper cable network which is distributed all over the city
- Private network that was connected to the rest of the City network at a single point

Timeline

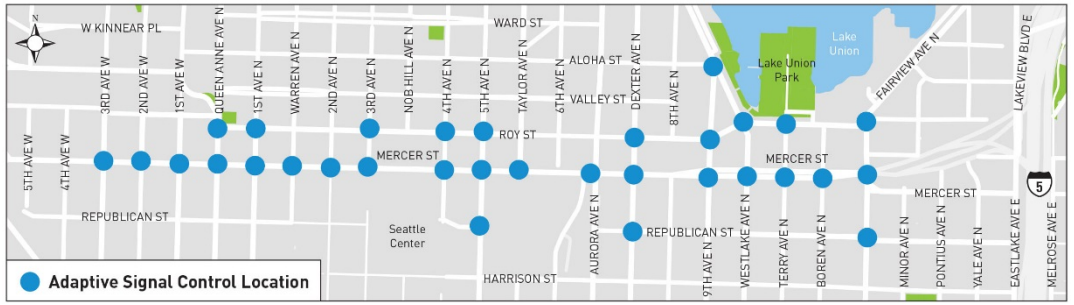
- 1980's – Twisted pair copper plant installed in the downtown establishing centralized traffic signal controller using serial communication
- 1990's –Fiber optic cables and analog traffic cameras installed along more remote corridors
- Early 2000's - Layer-2 switches establishing IP communication to signal controllers, video encoders, and DMS signs. All exist in a single flat network.
- 2005 – SDOT wins multiple federal grants and we triple the size of our ITS deployment
- 2006 – SDOT works with the IT department to create a design that segments the IP network into VLAN's based on geographic region and device type

Our System Today:

- Over 2250 total devices
- 1000+ Traffic Signals
- 250+ Traffic Cameras
- 650+ Layer 2 Switches
- Numerous Vehicle Detectors, Electronic Signs, Wireless Devices, Transit Arrival Signs, Road Weather Information Sensors, and more

And Growth Continues:

- Major Projects:
  - Seawall
  - Waterfront
  - Mercer East/Mercer West
  - 3rd Ave Transit
  - UW MICMA
  - T-5 Port Occupancy
  - Center City Bike Expansion



The Challenges:

- We're running out of IP network addresses
- No redundancy from our network to the City Network Backbone
- History of catastrophic failures due to broadcast storms

The Solution:

SABEY Data Centers

- Develop a project to modernize our system
- Create multiple points of redundancy to the City backbone
- Move servers to purpose built data center with layers of redundancy
- Create a scalable system that allows for years of additional growth
- Identify and address security vulnerabilities
- Remove SMT as single point of system failure

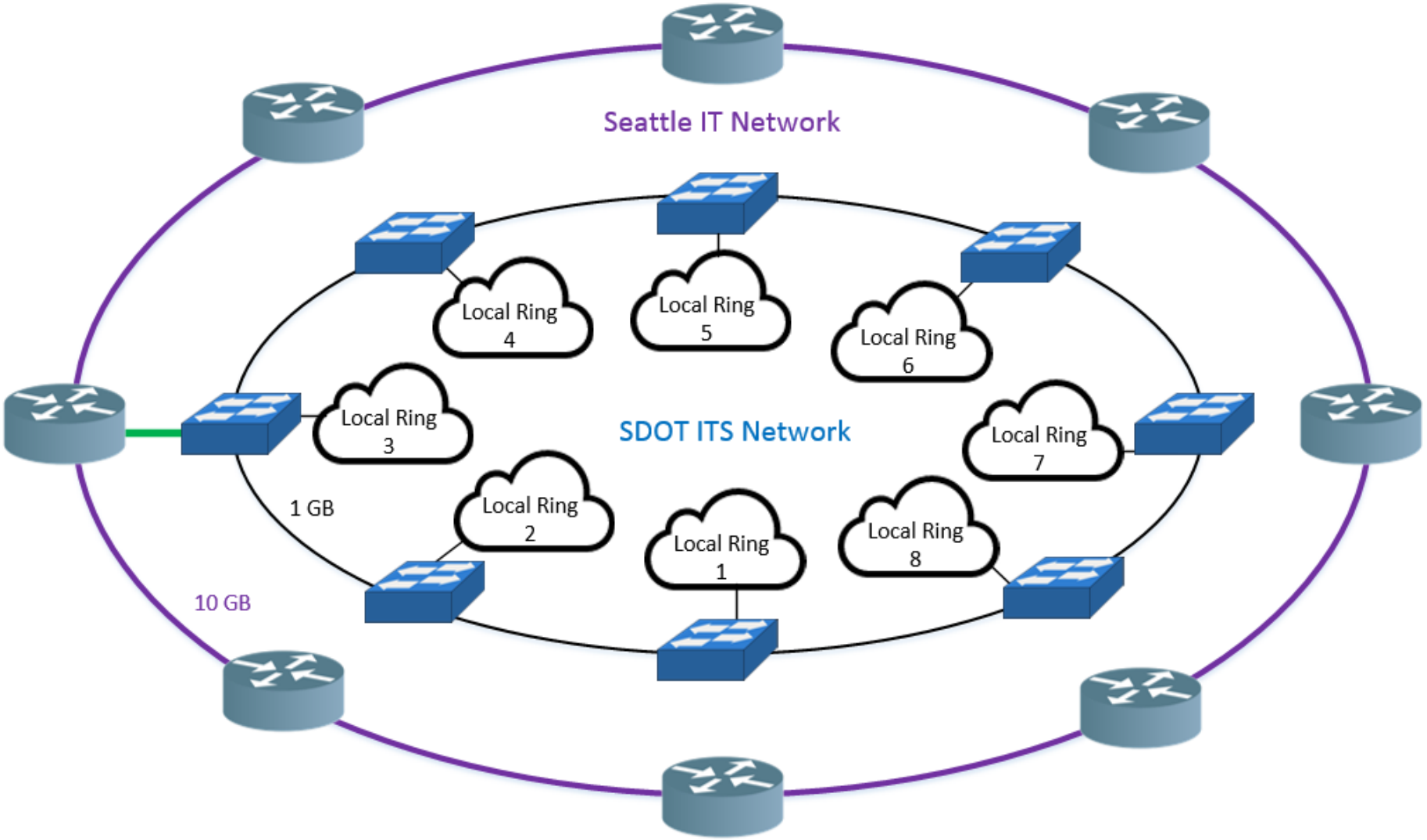
Network Resiliency and Redundancy Plan

- Hired a Network Engineering Consultant
- Determine cause of our instability issues and make recommendations to remedy them
- Remove the tower as a single point of system failure
- Provided instruction on how to create a scalable, reliable system

Strategy:

Findings:

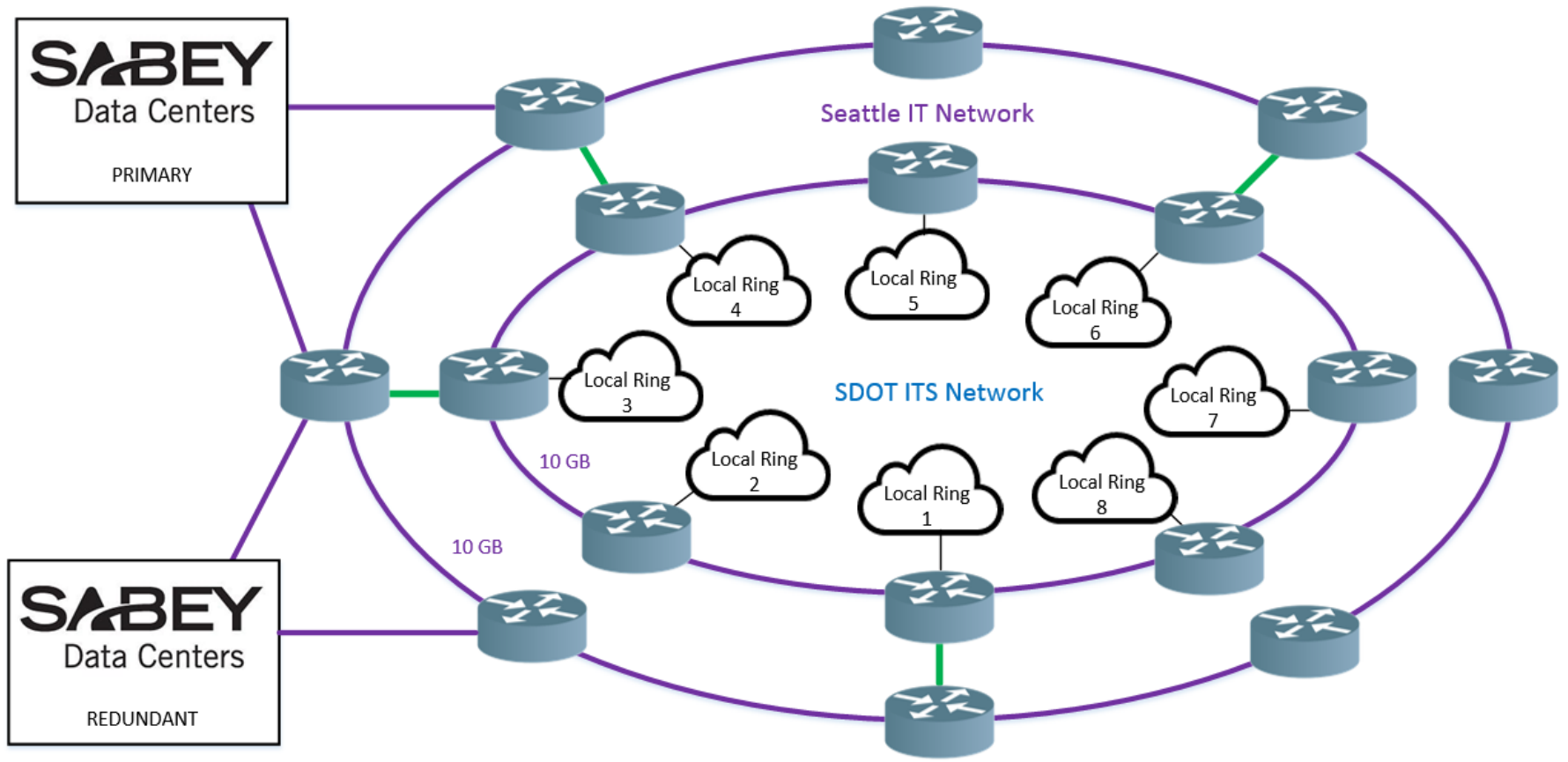
1. Too many devices participating in a single broadcast domain
2. Too many switches participating in a single spanning-tree instance
3. No redundancy to the Seattle IT Network



Course of Action:

Remedy:

1. Introduce routing to the field to multiply and shrink broadcast domains
2. Re-address all devices into the new networks
3. Do not exceed 7 switches in each spanning-tree instance
4. Introduce more connections to the Seattle IT Network
5. Consider 10 GB backhaul
6. SDOT Network administrators require Cisco certification



Work Required in Each Cabinet

- Switches need completely new configuration
- All devices receive new IPs
  - Controllers
    - Require reboot, causing intersection to go into flash
  - CCTV
  - DMS/RTIS
  - Sensys/Gridsmart
  - LPRs
  - RWIS
  - Radios
  - UPS
  - Serial IO Devices

Work Completed So Far

- 37 servers migrated to data centers
- 28 layer 3 switches installed in field
  - City backbone connection established to North Service Center
    - North End Redundancy
  - City backbone connection established to Water Ops
    - South End Redundancy
- 1170 devices transitioned
  - 1014 devices to go

Lessons Learned

- Take advantage of civil projects to install fiber
- Install more fiber than you think you'll need
- Plan for massive device deployments when partitioning address space
- Explore opportunities for service-oriented solutions (cellular communication and cloud applications)
- Provide annual training for IT staff

Questions?

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http://www.seattle.gov/transportation

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