A Power Steering Portal

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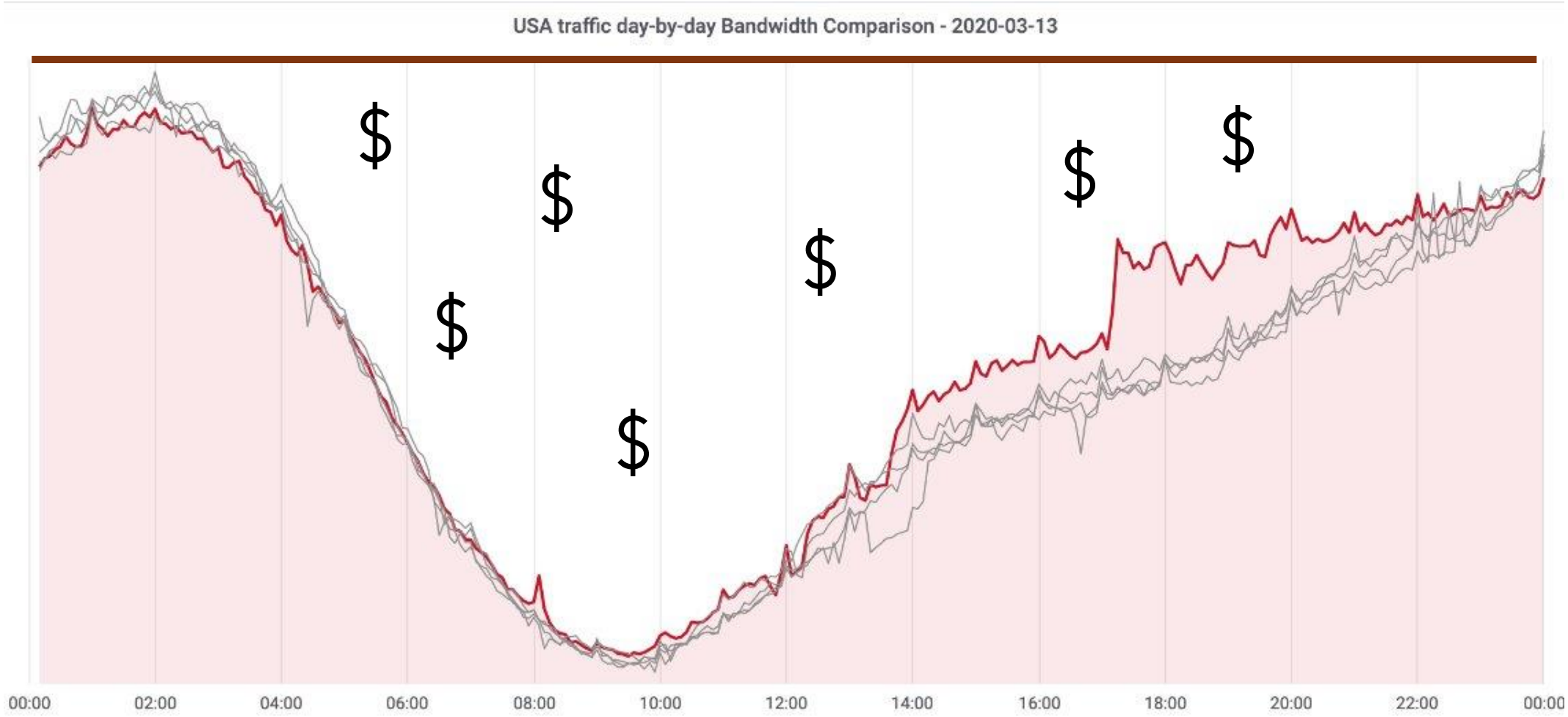
The Status Quo

- Network operators engineer networks with sufficient capacity to support peak loads
  - Redundant capacity to be used in case of failure
- Power consumption is constant
- Most networks exhibit predictable utilization patterns

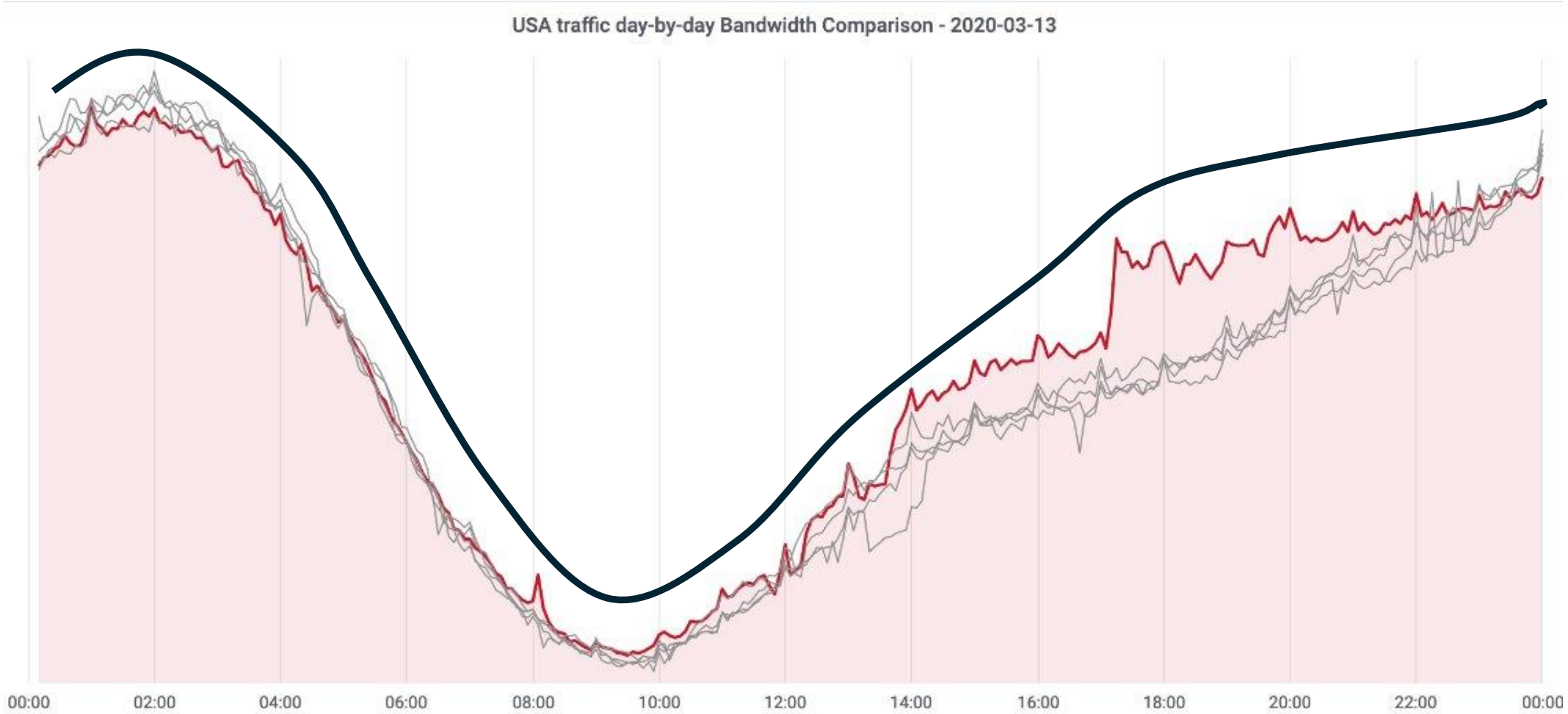
Money Flying Out The Window



Three Case Studies: Potential Savings

- Tier 1 European ISP
  - 106 nodes, 1144 links
  - Savings of 195KW out of an initial 265KW
  - 73.5% of PFE & link power
- Another European Tier 1 ISP
  - 192 nodes, 2691 links
  - Savings of 379KW out of an initial 491KW
  - 77.2% of PFE & link power
- An access network in a US Tier 1 ISP
  - 85 nodes, 1500 links
  - Savings of 58KW out of 207KW
  - 28.0% of PFE & link power

Goal: Power Savings



The Solution

- Consolidate traffic to facilitate power savings
- Power down unused network components when they are not needed
- Component granularity maximizes savings

Component Granularity

- Depends on your router architecture
- A component can be:
  - The entire router
  - A chassis or a Field Replaceable Unit (FRU)
    - Power supply, fan tray, switching interface board, line card, pluggable line card optics
  - An ASIC on an FRU

Which Components Consume Power

- Big Consumers
  - Line card ASICs (@250W)
  - Switching interface board ASICs (@150W)
- Lesser Consumers
  - Route processors (@100W)
  - Line card optics (@20)

❖Your results can vary depending on router architecture

❖ HVAC and fans also consume significant amounts of power

New Feature: Component Power Status

- Network elements contain components
- Each component has a power status
  - Up, Down
- The power status of each component can be changed independently
  - An operator can power down one line card without powering down another
  - An operator can power down a port without powering down another
- Containment matters
  - If an operator powers down a line card, they also power down every port that the line card contains

Operational Impact

- A typical network has thousands of network components
- Managing their power status can be labor intensive and error prone
- Some network events will require immediate power status actions
  - A backhoe cuts a link, driving the network into congestion. The best way to eliminate congestion is to power up a line card that is currently powered down

Introducing the Power Steering Portal

- Provides network visualization (maps)
  - Operational and utilization views
  - Power consumption and power efficiency views
- Displays weekly trends
  - Utilization, power consumption and power efficiency
- Proposes power savings policy
  - Which components can be powered up and down
  - When can they be powered up and down
- Deploys power savings policy

Power Steering Portal Status

- Under development, science project status
- Soliciting co-innovators
  - Need input from those with operational experience
  - Need operators to test drive the code

The Ask

- Interested in contributing to the project?
- Contact rbonica@juniper.net or tli@juniper.net

Security Considerations

- Like any network management function, the Power Management Portal must operate in a secure environment
- Like any network management protocol, the protocols that connect the Power Management Portal to its network elements must be secure
- If the Power Management Portal or its communications are compromised, an attacker can power down the network.

Why Only Two Power States

- Currently, the only the widely supported power states are Up and Down
- There is no consensus regarding what a third state should be
  - Standby? Low-speed?
- Implementation of a third power state may not be cost effective
  - Can components transition from Down to Up quickly enough, without a standby mode?
  - Will the low-speed mode save enough power to make it cost effective?
- Implementation and deployment of networking equipment that supports three modes will take years

Questions?