



Center for Networked Systems

UC San Diego

Traffic Optimization in Multi-layered WANs using SDN

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WAN Traffic Engineering with SDN

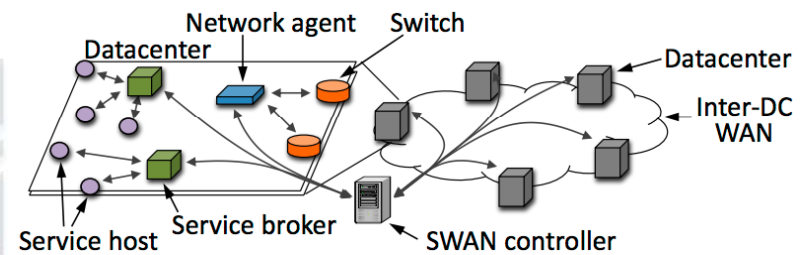
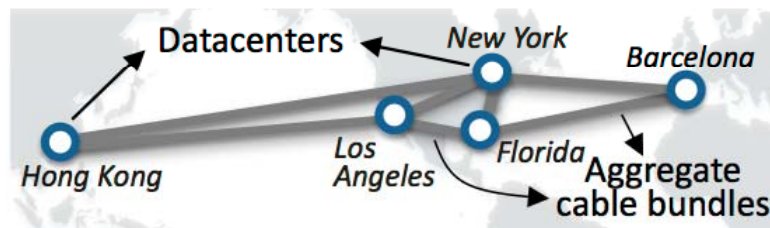
Recent work:

- Google's B4 (SIGCOMM'13)

- Microsoft SWAN (SIGCOMM'13)

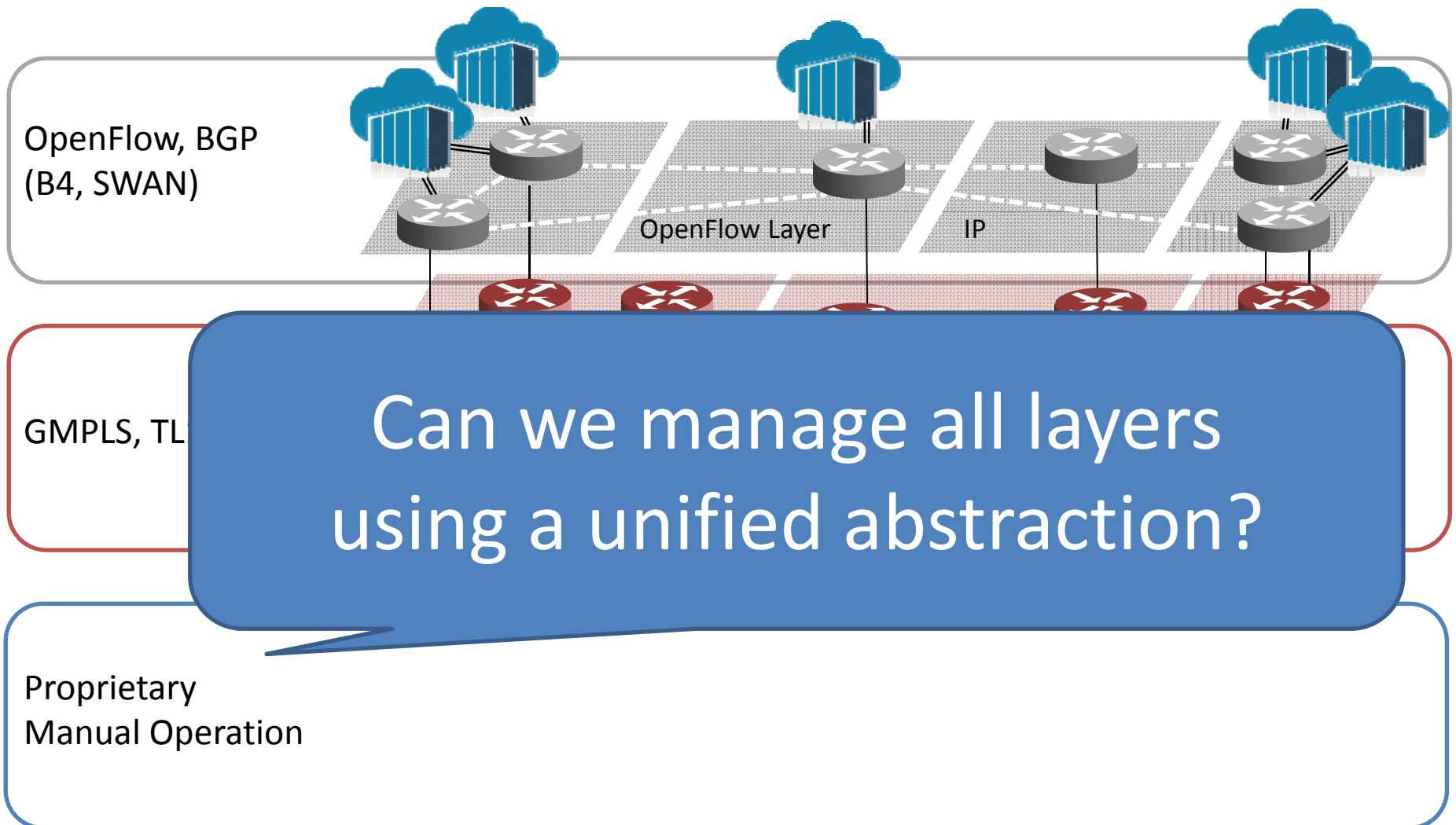


Figure 1: B4 worldwide deployment (2011).



Improved network utilization, flexibility, resilience with centralized management, Software Defined Networking, and OpenFlow

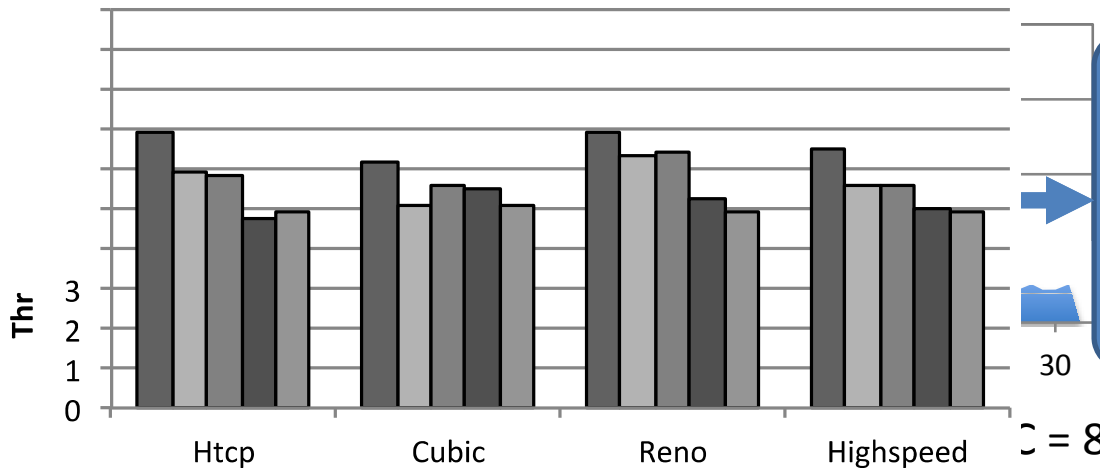
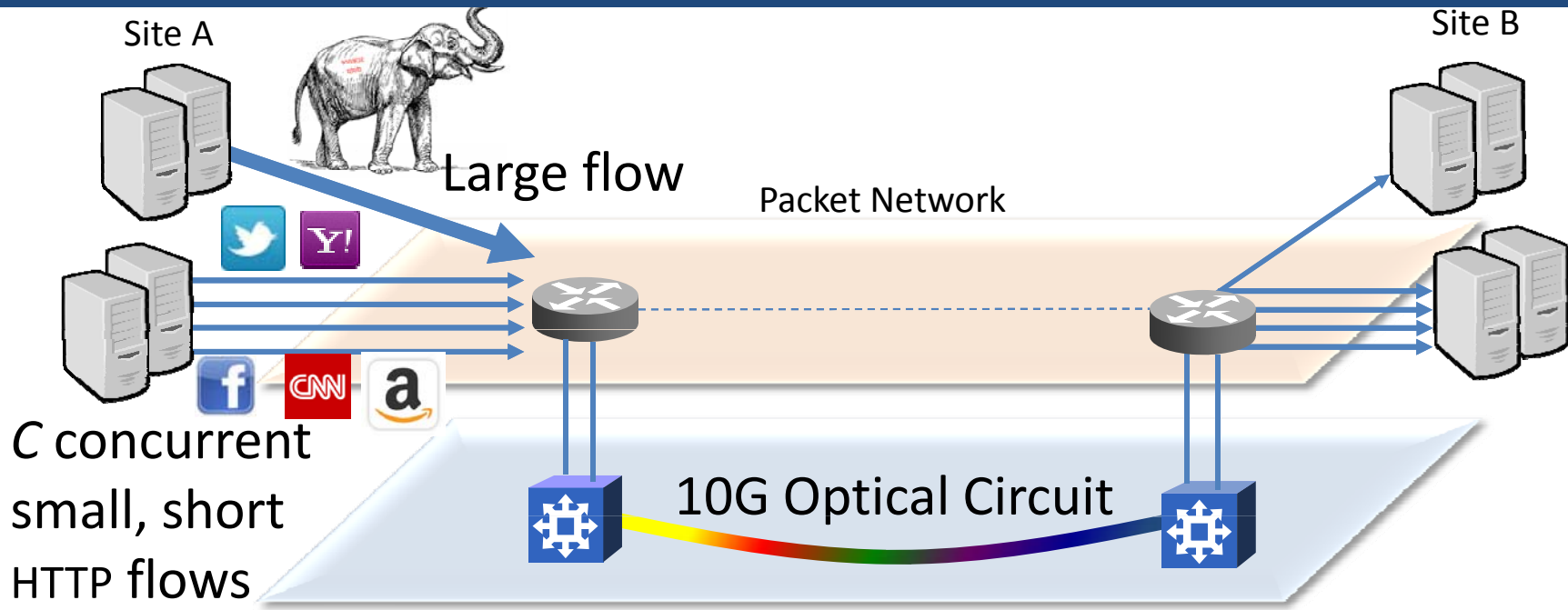
The hidden multi-layered infrastructure



Why is this important?

- Scenarios where dynamic management wins:
 - Multi-layer traffic optimization
 - Current WAN management assume static topology
 - If demand grows, new paths are added manually
 - In the limit, current solutions either throttle traffic (SWAN, B4) or offer degraded service
 - Bandwidth virtualization
 - Static allocation of higher capacity optical pipes can result in wasted capacity for variable demands
 - Flows of different demand (mice vs. elephant)
 - Interaction of flows might lead to lower utilization

Distinct TCP Flows vs. Utilization

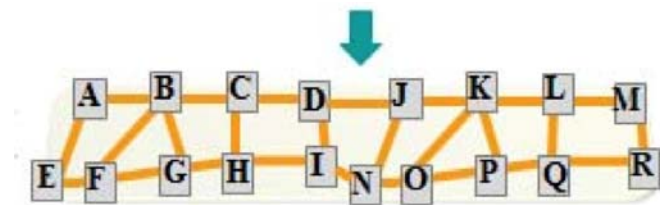
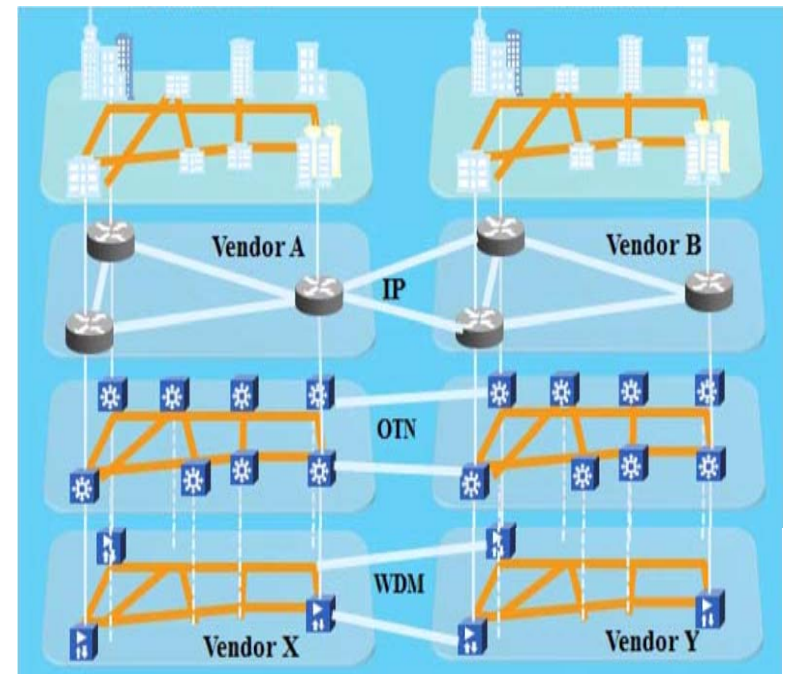


Congestion control triggered by intermittent small flows contributes to poor utilization

Unified control plane using SDN

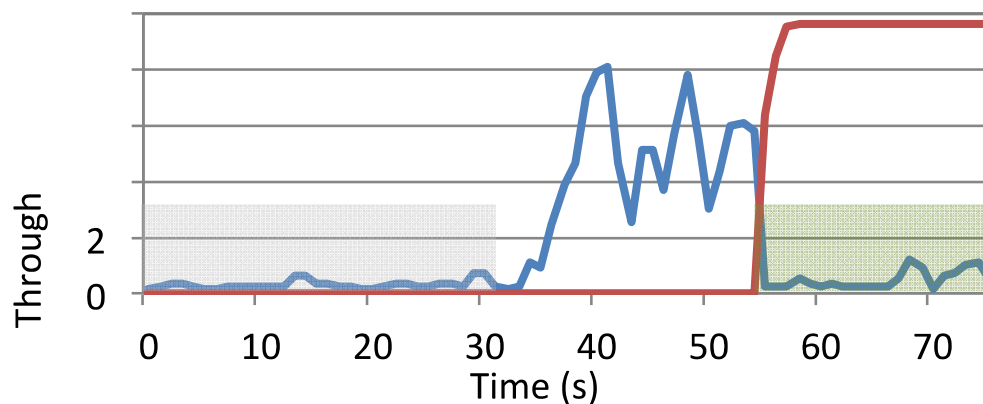
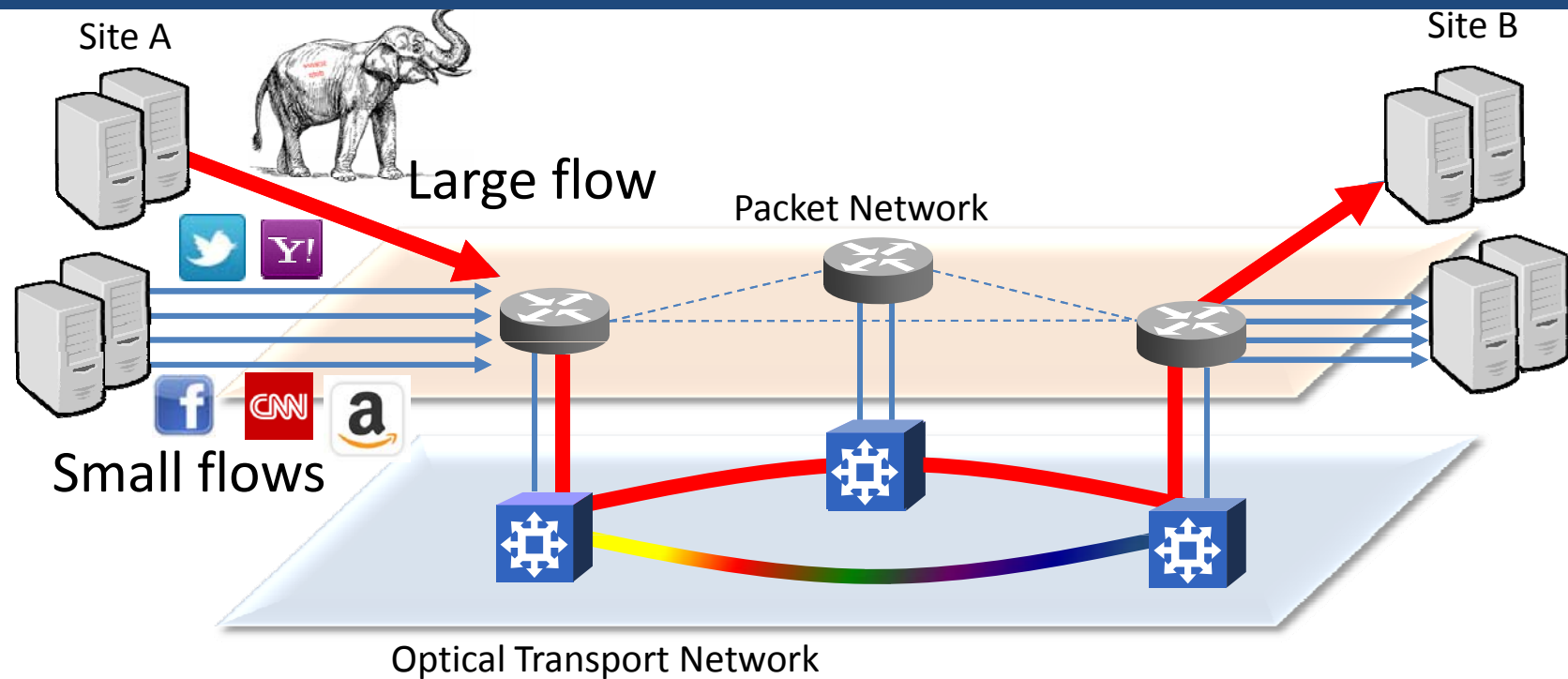
Our approach:

- Map lower layer concepts to OpenFlow
- Allows using unmodified SDN Controller
- Aggregate traffic info from all layers
- Optimize resource allocation across layers



Traffic Optimization in Multi-Layered WANs using SDN. H. Rodrigues, I. Monga, A. Sadasivarao, S. Syed, C. Guok, E. Pouyoul, C. Liou, T. Rosing. In 22nd IEEE Symposium on High-Performance Interconnects, 2014 - **Best Student Paper**

Enabling predictable application performance



- Time = 0: Only small flows
- Time = 30: Large data transfer started
- Time = 55: Large data transfer offloaded to dynamically allocated circuit



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Thank you!

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