



Extending WAE's Use case using API

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Agenda

- What's new in WAE?
- Optimization Prediction Module API
- Use Case Demo

What's new in WAE?

New paradigm in WAE 7.1: Real Time Bandwidth Architecture

Real-time
Use Cases

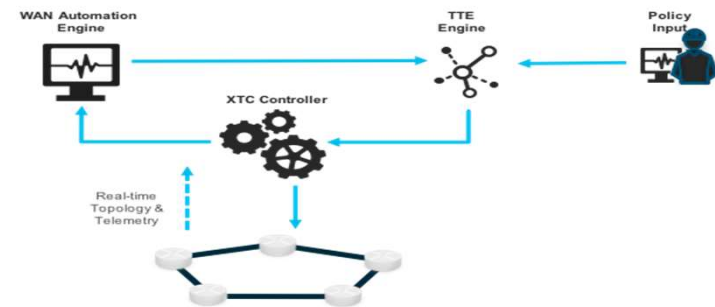
In-Memory Network
Model

Reactive Model Building

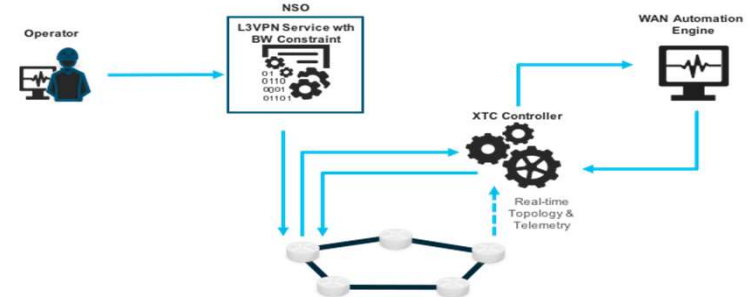
Real-time Topology
using SR-PCE (XTC)

Real Time
Use Cases

Bandwidth Optimization



Bandwidth on Demand



YANG Data Model

- YANG data structure to represent network model

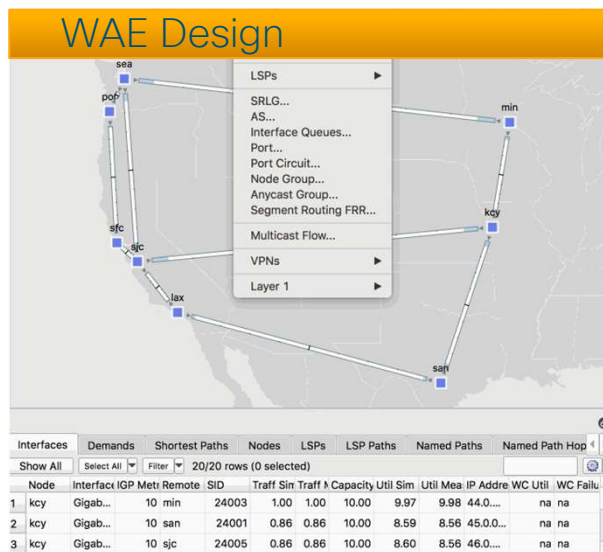
```
nodes {
  node iosxrv-1.virl.info {
    ip-address 192.168.100.1;
    ip-manage 172.16.1.1;
    platform {
      vendor Cisco;
      model IOS;
      os "IOS XR 6.2.1.36I[Default]";
    }
    type physical;
    active true;
    interfaces {
      interface GigabitEthernet0/0/0/0 {
        capacity 1000.0;
        description "to iosxrv-101";
        row {
          ifindex 4;
          type 6;
          administrative-status up;
          operational-status up;
          class-type unknown;
          ip-addresses {
            ip-address 10.100.1.149 {
              prefix-length 30;
            }
          }
          hierarchy {
            layer-type l3;
          }
        }
      }
    }
  }
}
```

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```
named-paths {
  named-path dynamic {
    active true;
  }
  named-path dynamic[1] {
    active true;
  }
  named-path dynamic[2] {
    active true;
  }
  named-path dynamic[3] {
    active true;
  }
}
lsp {
  lsp tunnel-te134 {
    destination iosxrv-3.virl.info;
    unresolved-destination 192.168.100.3;
    setup-pri 7;
    hold-pri 7;
    exclude [ 0 1 10 11 12 13 14 15 2 3 4 5 6 7 8 9 ];
    active true;
    metric-type auto-route;
    class Default;
    private false;
    te-metric-disabled false;
    frr-enabled true;
    auto-bandwidth false;
    type rsvp;
    load-share 1.0;
    lsp-paths {
      lsp-path 5 {
        named-path dynamic;
        standby false;
        active true;
        type rsvp;
      }
    }
    row {
      lsp-index 8;
      administrative-status up;
      operational-status up;
    }
  }
}
```

Optimization Prediction Module (OPM) API

- Northbound API based on RESTconf/Netconf
- High-level pythonic API



WAE OPM API

```
filename = 'some/plan/file.pln'
with open_plan(filename) as network:
    model = network.model

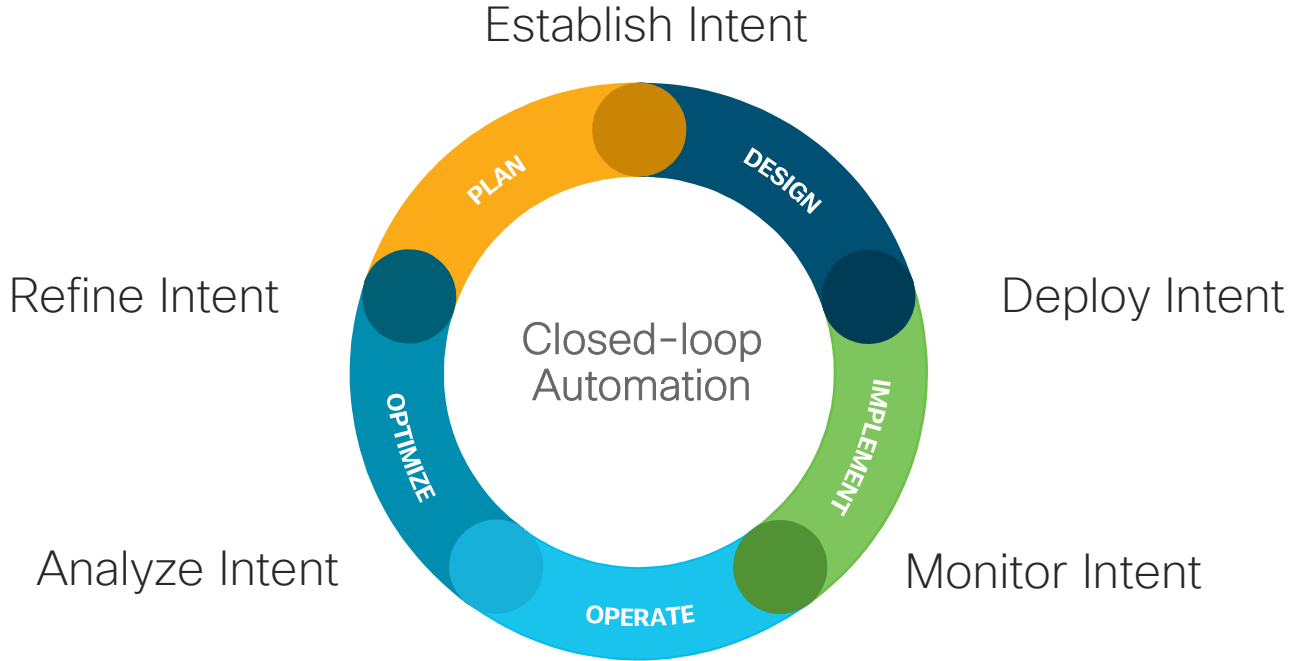
    # Get NetworkObjectManager for LSPs
    lsp = model.lsp

    # Add new LSP using append()
    new_lsp = lsp.append({
        'source': 'cr1.wdc',
        'name': 'test',
        'destination': network.model.nodes['cr1.atl'],
        'setup_bandwidth': 1000.0,
        'lsp_type': 'rsvp',
        'active': True
    })
```



Use Cases

Network Operation Lifecycle



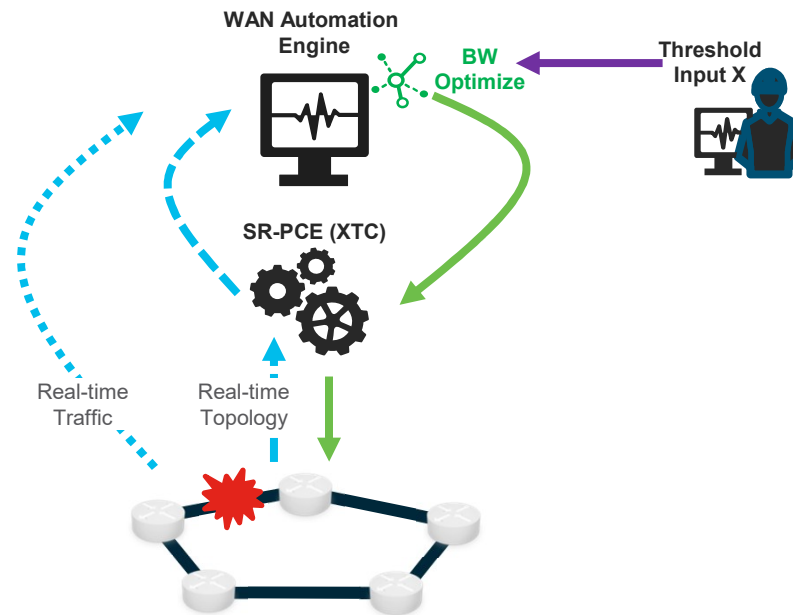
Use Case: Tactical Bandwidth Optimization

Network Optimization with continuous tracking of network state



- **The Problem:** Network state changes continuously and operators are having problem tracking and reacting to rapid network changes that often lead to congestions
- **The Solution:** With WAE, XTC and Segment Routing, a closed loop network state tracking enables WAE with Tactical TE engine to continuously track changes and react to optimize the network
- **The Value:** Real-time optimization that enables the network to continuously run optimally.

1. WAE constantly learns network topology and traffic
2. Network state changes are detected by SR-PCE / WAE which will trigger BW Optimization
3. BW Optimization checks for policy violation
 - If Threshold > X, optimization is run and SR Policy deployed if needed
 - If Threshold <= X, no change



Use Case: Service+Network Assurance

Service assurance with network awareness



- **The Problem:** Service assurance typically does not have awareness of topology context
- **The Solution:** Crosswork Situation Manager integrating WAE to provide topology awareness on service events
- **The Value:** Topology awareness provide better context on service events

1. ..
2. ...

