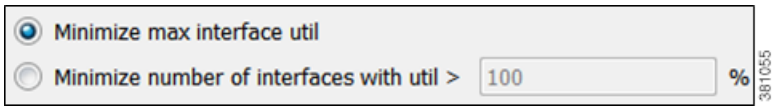
LSP Loadshare Optimization

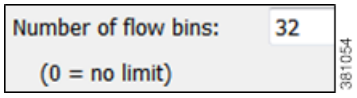
The LSP Loadshare Optimization tool automates the process of finding and setting the most favorable loadshare ratios across parallel LSPs to balance traffic and avoid congestion. This optimization is based on which of the following options are selected. Only interfaces using parallel LSPs are included in the optimization.

- Minimize max interface util—Minimize the maximum interface utilization over all interfaces on the LSP routes. WAE Design attempts to minimize the number of loadshare parameter changes required to do so.



- Minimize number of interfaces with util > ___ %—Minimize the number of interfaces that have a utilization greater than the specified value. This is a looser constraint than minimizing the maximum interface utilization. Therefore, WAE Design has the opportunity to modify as few Loadshare values as possible, thus reducing the amount of reconfiguration required.

- Number of flow bins—Routers typically cannot divide flows arbitrarily between parallel LSPs, but instead allocate them to a fixed number of "bins" of approximately equal size. The bins are then divided between the parallel LSPs. This option enables you to specify the total number of bins, which in turns places a constraint on the traffic division.



Upon completion, WAE Design tags the LSPs with LSPLoadshare and generates a new plan file named with an -Lshare suffix. This plan file opens, showing the LSPs table that is filtered to these rerouted (and newly tagged) LSPs. Saving this plan file then simplifies the process of identifying which LSPs to reconfigure in the network. Both the tags and the new plan file names are editable.

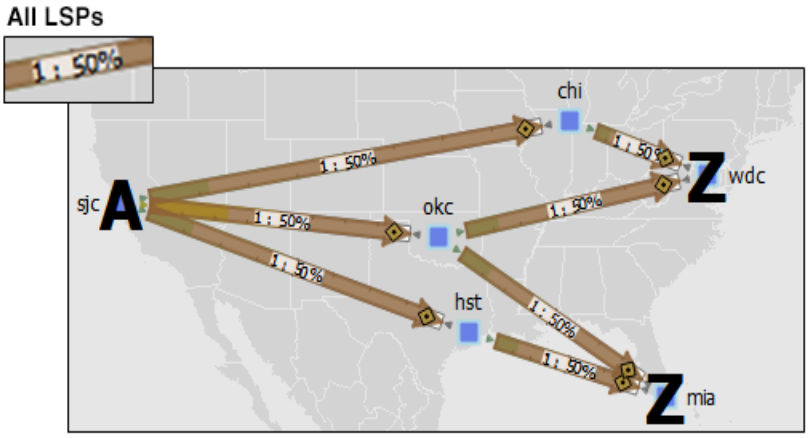
Also upon completion a report is generated, identifying how many LSPs and interfaces were affected, the number of bins used, the resulting maximum interface utilization, and if applicable, the number of interfaces with utilization over the specified threshold.

Minimization Example

The base plan for this example, Acme_Network, contains two sets of parallel LSPs, each with a Loadshare value of 1 and each using strict hops on named paths to reach its destination. All of these LSPs have a Traff Sim of 3,000 Mbps. The interfaces to which these LSPs filter all have a Traff Sim value of 3,000 Mbps, except for sjc-to-okc, which has 6,000 Mbps of simulated traffic (Figure 22-1).

- Using the Acme_Network plan file (Figure 22-1), if you minimize the maximum interface utilization across all LSPs, all four Loadshare parameters change, and the maximum interface utilization is 40% (Figure 22-2). The default plan file name and default LSP tags are used, thus naming the new plan Acme_Network-Lshare and the tags as LSPLoadshare.
- Using the Acme_Network plan file (Figure 22-1), if you minimize the number of interfaces with utilization greater than 50%, only two of the Loadshare values change (Figure 22-3). Notice in the figure how Loadshare values are relative to the other Loadshare values for parallel LSPs, and not to all LSPs in the table. Also, only the affected LSPs are tagged.

Figure 22-1 Example Acme Network Before LSP Loadshare Optimization



Interfaces

Node	Interface	Remote Node	Traff Sim	Util Sim
cr1.sjc	to_chi	cr1.chi	3000.00	30.00
cr1.sjc	to_okc	cr1.okc	6000.00	60.00
cr1.sjc	to_hst	cr1.hst	3000.00	30.00
cr1.chi	to_wdc	cr1.wdc	3000.00	30.00
cr1.okc	to_wdc	cr1.wdc	3000.00	30.00
cr1.hst	to_mia	cr1.mia	3000.00	30.00
cr1.okc	to_mia	cr1.mia	3000.00	30.00

LSPs

Name	Source	Destination	Loadshare	Traff Sim	Tags
sjc-wdc-1	sjc	wdc	1.00	3000.00	
sjc-wdc-2	sjc	wdc	1.00	3000.00	
sjc-mia-2	sjc	mia	1.00	3000.00	
sjc-mia-1	sjc	mia	1.00	3000.00	

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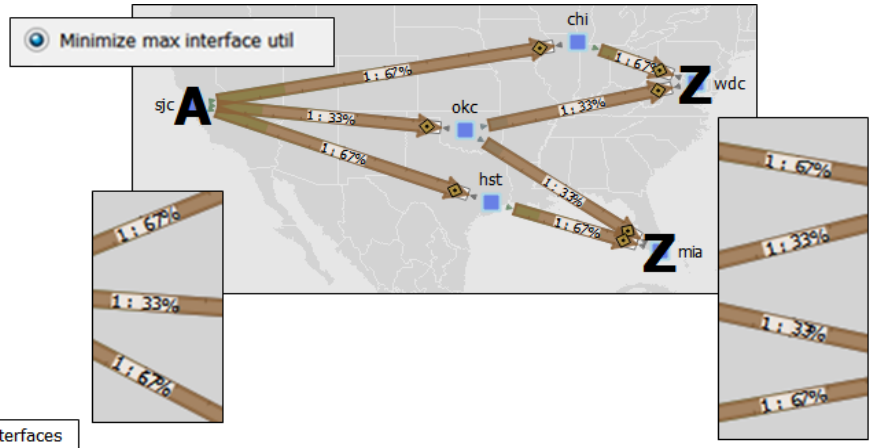
Figure 22-2 Example Acme Network After Minimizing Maximum Interface Utilization



Interfaces

Node	Interface	Remote Node	Traff Sim	Util Sim
cr1.sjc	to_chi	cr1.chi	4000.20	40.00
cr1.sjc	to_okc	cr1.okc	3999.60	40.00
cr1.sjc	to_hst	cr1.hst	4000.20	40.00
cr1.chi	to_wdc	cr1.wdc	4000.20	40.00
cr1.okc	to_wdc	cr1.wdc	1999.80	20.00
cr1.hst	to_mia	cr1.mia	4000.20	40.00
cr1.okc	to_mia	cr1.mia	1999.80	20.00

LSPs

Name	Source	Destination	Loadshare	Traff Sim	Tags
sjc-wdc-1	sjc	wdc	66.67	4000.20	LSPLoadshare
sjc-wdc-2	sjc	wdc	33.33	1999.80	LSPLoadshare
sjc-mia-2	sjc	mia	66.67	4000.20	LSPLoadshare
sjc-mia-1	sjc	mia	33.33	1999.80	LSPLoadshare

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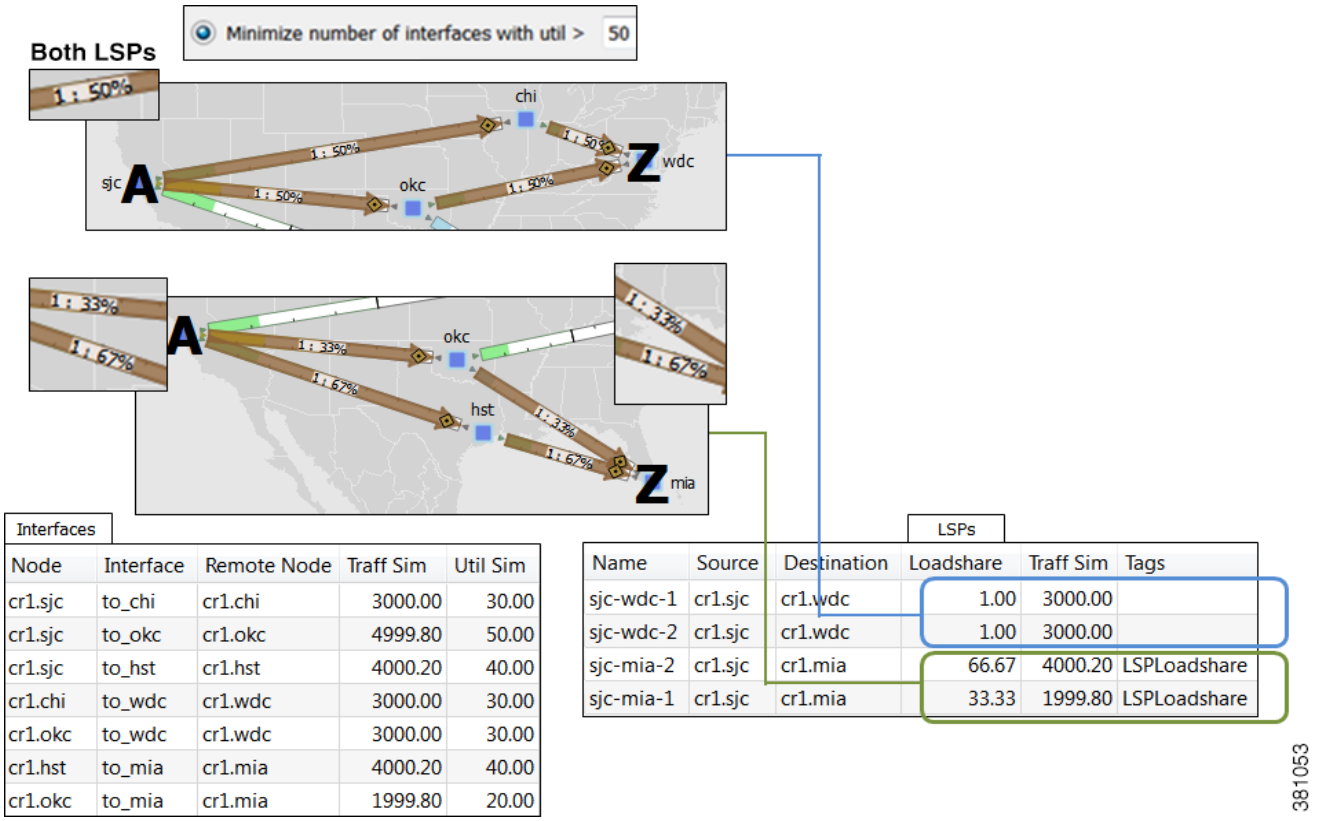
Figure 22-3 Example Acme Network After Minimizing Number of Interfaces with Utilization > 50%



Interfaces

Node	Interface	Remote Node	Traff Sim	Util Sim
cr1.sjc	to_chi	cr1.chi	3000.00	30.00
cr1.sjc	to_okc	cr1.okc	4999.80	50.00
cr1.sjc	to_hst	cr1.hst	4000.20	40.00
cr1.chi	to_wdc	cr1.wdc	3000.00	30.00
cr1.okc	to_wdc	cr1.wdc	3000.00	30.00
cr1.hst	to_mia	cr1.mia	4000.20	40.00
cr1.okc	to_mia	cr1.mia	1999.80	20.00

LSPs

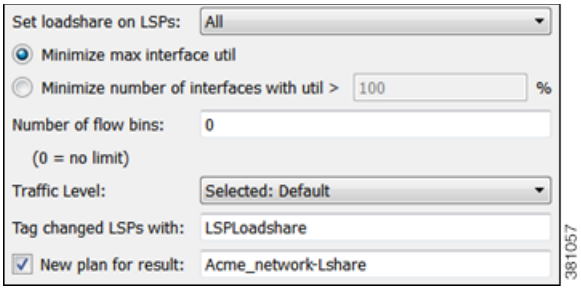
Name	Source	Destination	Loadshare	Traff Sim	Tags
sjc-wdc-1	cr1.sjc	cr1.wdc	1.00	3000.00	
sjc-wdc-2	cr1.sjc	cr1.wdc	1.00	3000.00	
sjc-mia-2	cr1.sjc	cr1.mia	66.67	4000.20	LSPLoadshare
sjc-mia-1	cr1.sjc	cr1.mia	33.33	1999.80	LSPLoadshare

Bin Example

In this example, a node uses a maximum of 32 bins, and the optimal traffic allocation is 45% of the traffic through LSP A and 55% of the traffic through LSP B. The node that sources these two LSPs, however, cannot do this exact split. The optimization divides the traffic into 32 bins, each with the same amount of traffic in them. Thus, each bin has 3.125% of the traffic (100% of the traffic divided by 32). The optimization also determines how the node should split the traffic. In this case, the split is to give 43.75% (which is 14 bins of 3.125% each) to LSP A and 56.25% (which is 18 bins of 3.125% each) to LSP B. Thus, it optimizes and distributes 32 (14+18) bins of traffic. This is as close as possible to the optimal 45%/55% split using 32 bins.

Run LSP Loadshare Optimization Tool

Step 1 Select one or more LSPs. If you do not select any LSPs, the tool uses all LSPs in the plan file.



Step 2 Select the Tools->LSP Loadshare Optimization menu.

Step 3 Select which LSPs on which you want to optimize the Loadshare value.

Step 4 Select which method of optimization to use.

- Minimize max interface util
- Minimize number of interfaces with util > ___ %

Step 5 If distributing the traffic to bins, enter the total number of flow bins to use.

Step 6 Optional: Select which traffic level to optimize.

Step 7 Optional: Change the LSP tag name.

Step 8 Optional: Select whether to create a new plan file based on the results, and change how to name it.

Related Topics

- MPLS Simulation chapter
- RSVP-TE Optimization chapter
- Segment Routing Simulation chapter