

# Automatic Network Congestion Relief

AINIMA WG

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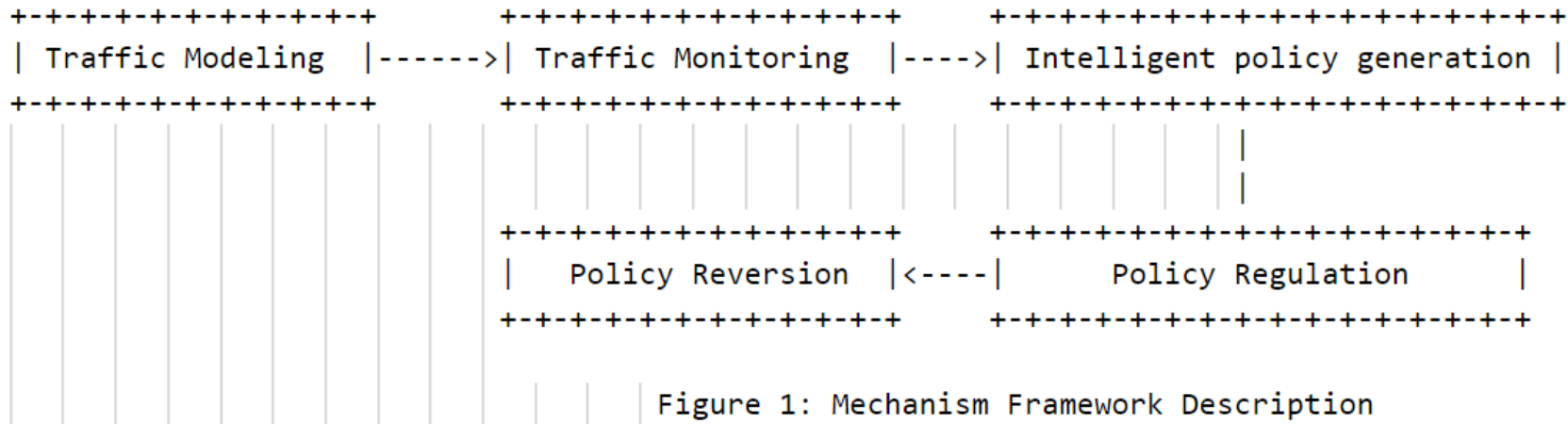
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# Background

- Nowadays, fiber optic failures occur frequently, leading to network congestion and becoming a common pain point for operators. These issues require specific personnel to conduct daily inspections of traffic and manually hourly adjust configurations, which significantly increases the difficulty of network maintenance.
- We introduce an **automatic congestion relief mechanism** based on intelligent traffic analysis and auto-regulation. In the event of congestion caused by fiber optic failures, it can respond intelligently and self-heal in real time, solving the network congestion and maintenance challenges faced by operators due to fiber optic failures, and ensuring the stable operation of the network.

# Automatic Network Congestion Relief

This second - level congestion relief mechanism is automated through the intelligent module within the device. Leveraging intelligent traffic analysis, it precisely calculates the volume of traffic requiring redistribution. Subsequently, it redirects this traffic to paired devices via inter-device protocol announcements and the automatic adjustment of routing priorities.



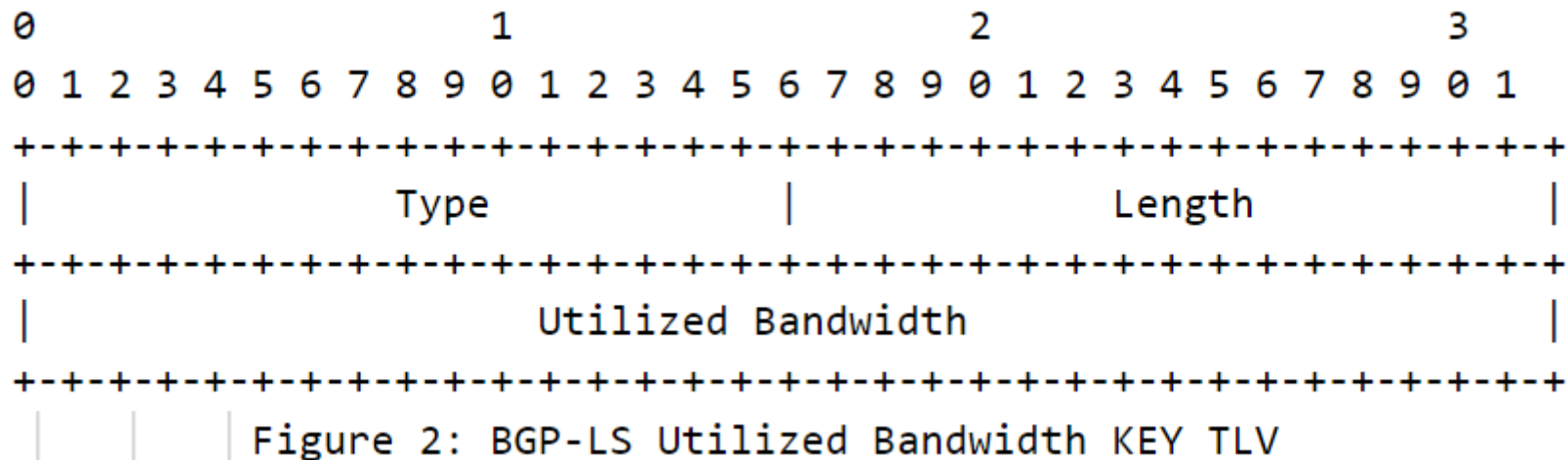
## Step1: Traffic Modeling

- Real-time Traffic Sorting
- The intelligent component of the AI chip subscribes to the BGP RIB-out (Routing Information Base-outbound) and employs intelligent flow recognition algorithms to perform AI-based traffic modeling.
- Intelligent Flow Feature Statistics: Flow rate, Packet length, Proportion of TCP/UDP traffic, Proportion of fragmented packets, Proportion of SYN packets.

# Automatic Network Congestion Relief

- **Step2: Traffic Monitoring**

- Protocol Extension and Information Acquisition: we use the extended BGP-LS protocol (BGP-LS Utilized Bandwidth)
- BGP-LS Utilized Bandwidth TLV: reusing the Maximum Link Bandwidth TLV (Type 1089) [RFC5305].
- Intelligent Congestion Awareness.





# usecase

- **Step1: Traffic Modeling**

- Real-time TOP-N traffic modeling with AI chips.
- 100GB x 8 total bandwidth between CR1-C1 & CR2-C2, 600GB current traffic on each.

- **Step2: Traffic Monitoring**

- Devices auto-detects CR1-C1 link failures (5 link).

- **Step3: Intelligent Policy Generation**

- Identifying the TOP-N routing prefixes to be adjusted.
- The intelligent module of CR1 auto-generates policies.

- **Step4: Policy Propagation**

- CR1 auto-sends policies to C1.
- C1 updates the routing. Divert 200G high - priority traffic to CR2 - C2 to ease CR1 - C1 congestion.
- Result: CR1-C1 down to 300G, CR2-C2 up to 800G, efficient resource use.

- **Step5: Policy Reversion**

- Device detects CR1-C1 link recovery.
- Gradually withdraws policies.

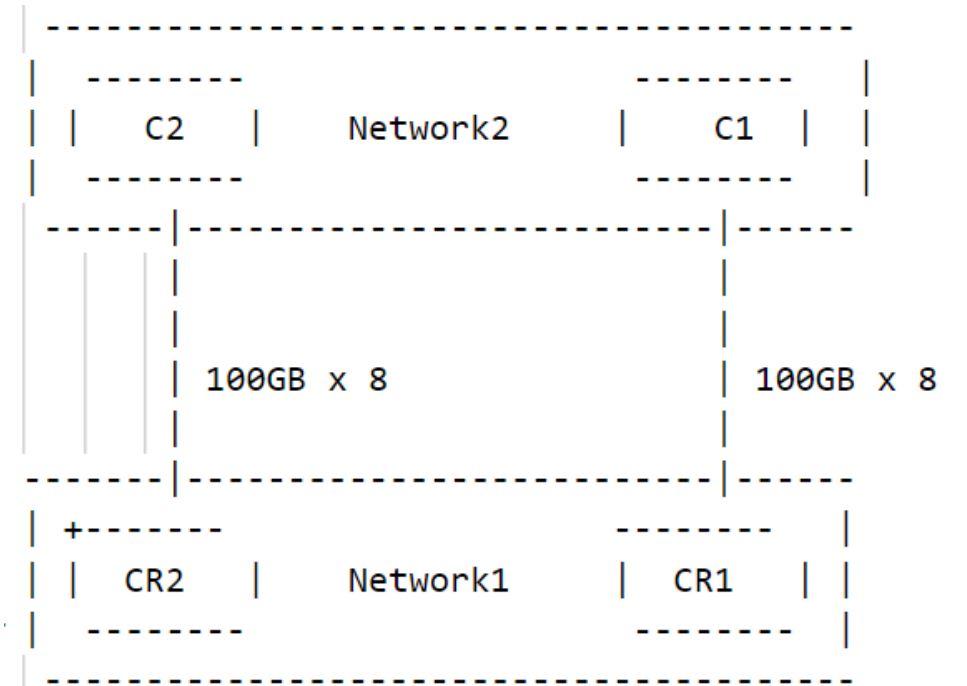


Figure3: Intelligent Decision-Making usecase

Thanks for listening!