Fault Localization of Loop Network Devices based on MEC Platform

Qi Zhang、 Xueqin Lin
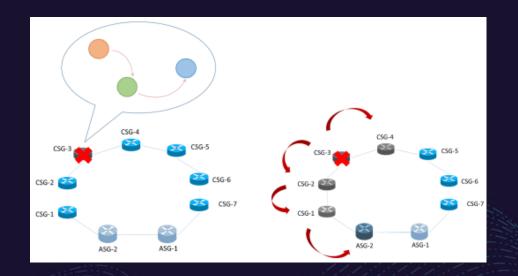-- GuoChuang ChapterIX

Directory

PART **1**
Question
descriptions

Fault Localization of Loop Network Devices

Alarm logs：
   The logs is about the MEC(Multi-access Edge Computing) which is a kind of communication cloud. In order to improve MEC operation ability, there should have some methods, such as rapid discovery, positioning, prediction, self-healing, etc.
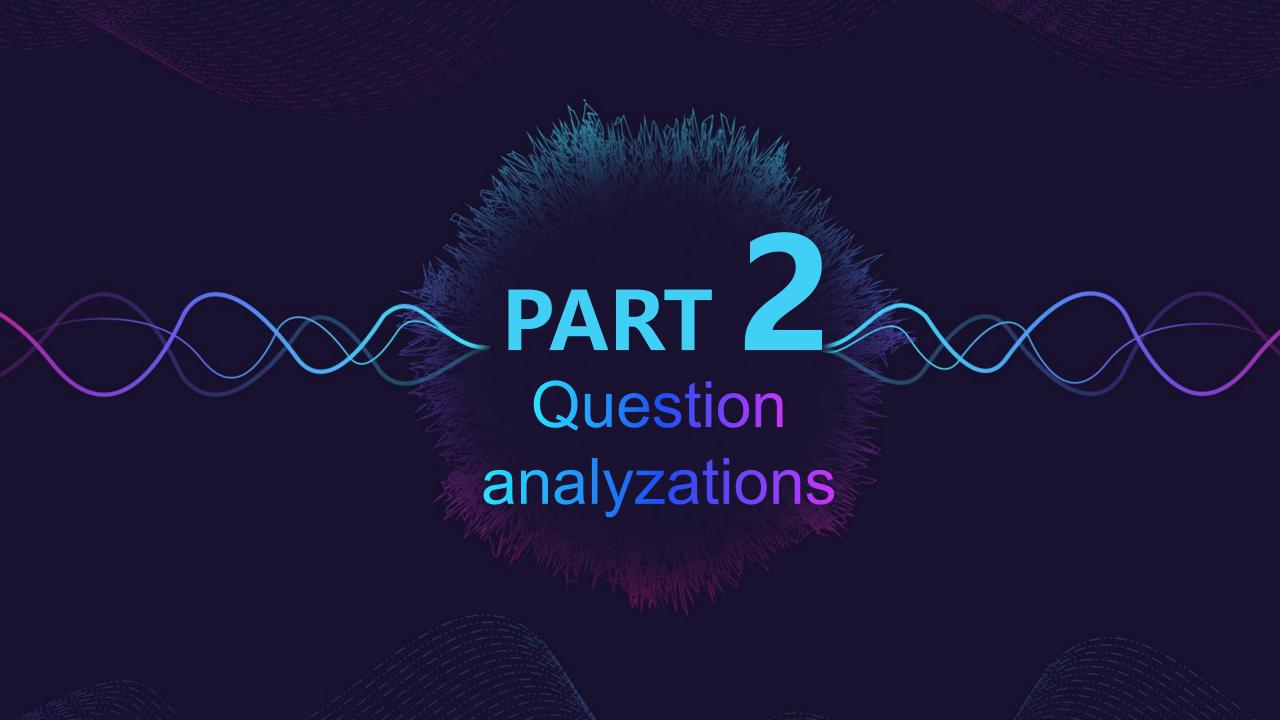
Original data
 The alarm log is unstructured text information, contains log level (level 8), module, details, etc..

PART **2**

Question

analyzations

PART 3

Architecture design

Architecture

Fifth — Result output

Fourth — Network topology

Third — association analysis

Second — Time window division

First — Alarm preprocessing

Alarm preprocessing

Extract information

Add brief name

Eliminate alarm

- using regularization rules → standard data.

- Add year information.

- Deal with some incomplete data

- Use natural language processing

- Extract the first five keywords

- Regularization method

- Delete duplicate alarms

- Delete the high frequency data

- Delete low level alarm

Time window planning

Neighbors

Add own neighbors to each device

time window

The time window is set to 1 minutes

Frequent items

Get frequent items from time window

sliding step

Slide one alarm at a window time

Traditional Eclat algorithm:
- **Generate all subsets**
  - Takes up a lot of memory
  - Waste running time
- **Have no any direction for each pair alarm**
  - {A, B} and {B, A} are the same frequent terms.

Our method:
- **Device neighbors** :
  - The alarms will spread through the adjacent equipment
  - Set adjacent equipment as neighbors for each device
- **Special Eclat algorithm** :
  - Do not generate subsets, and directly generate the probability/score that forward item leads to backward item.
  - Just calculate the score between items and their neighbor
- **Advantages**:
  - Ensure the sequence between alarms
  - Reduce running time and memory

CSG-8&VFS&MIB_OPERATE_PUT_FILE => CSG-8&HWCM&CFGCHANGE

Subordinate alarm

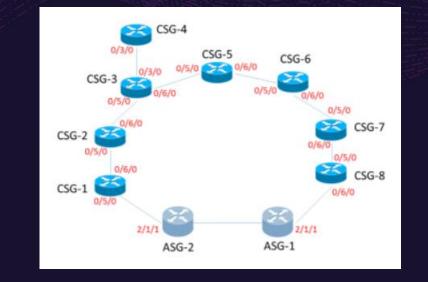| network topology	node score	root device	subordinate equipment
Drawing the network topology by the relation rule	Calculate input radio Additional rate: 1> alarm level 2> port relationship	• Highest score is the root alarm • Locates the alarm on original data	• With time window, find the subordinate alarm, equipment, etc..

CSG-8&VFS&MIB_OPERATE_PUT_FILE => CSG-8&HWCM&CFGCHANGE

The results are showed that:
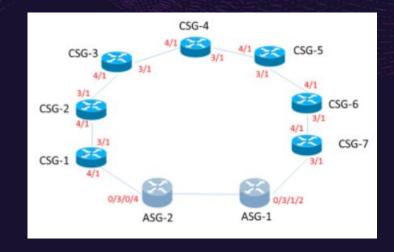

A-dataset:
- The root node obtained is CSG-8
- Subordinate nodes are ASG-1 and CSG-7.
- Verify these nodes with answer and check the interface flow in the data set.
- Therefore, the port of CSG-8 is down.

time	position	module	level	Brief	description
2019-03-27 19:41:20	CSG-8	LSPM	2	MPLSTUNPRIDOWN	OID 1.3.6.1.4.1.2011.5.25.121.2.1.47 The prima...
2019-03-27 21:57:43	CSG-8	LSPM	2	MPLSTUNPRIDOWN	OID 1.3.6.1.4.1.2011.5.25.121.2.1.47 The prima...
2019-03-28 07:35:29	CSG-8	LSPM	2	MPLSTUNPRIDOWN	OID 1.3.6.1.4.1.2011.5.25.121.2.1.47 The prima...

B-dataset:
- The root node obtained is CSG-2
- The subordinate nodes are CSG-3, CSG-4 , ASG-2.
- Combined with topology, subordinate nodes, original alarm logs.
- CSG-1 does not have any current alarm.
- CSG-1 equipment must be lost.

level	time	position	module	description
1	2019-08-06 20:31:50	CSG-2	SSM	Loss Of Timing Inputs panel:4 port:1

PART 4

Summary

Advantages :
- better adaptable
  - Just have some common preprocessing algorithm.
  - Eclat algorithm do not depend on business scenario.
- alarm association rule base
  - There are precise alarms relationship.
- Alarm network propagation topology
  - Help to locate root fault accurately and fast.

Future ideas:
- Add more data preprocessing methods.
- Improve the calculate method of node score in the final stage.

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