Fault Localization of Loop Network Devices based on MEC Platform

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-- GuoChuang ChapterIX

Directory

01 Question descriptions

02 Question analyzations

03 Architecture design

04 Summary

PART 1

Question descriptions

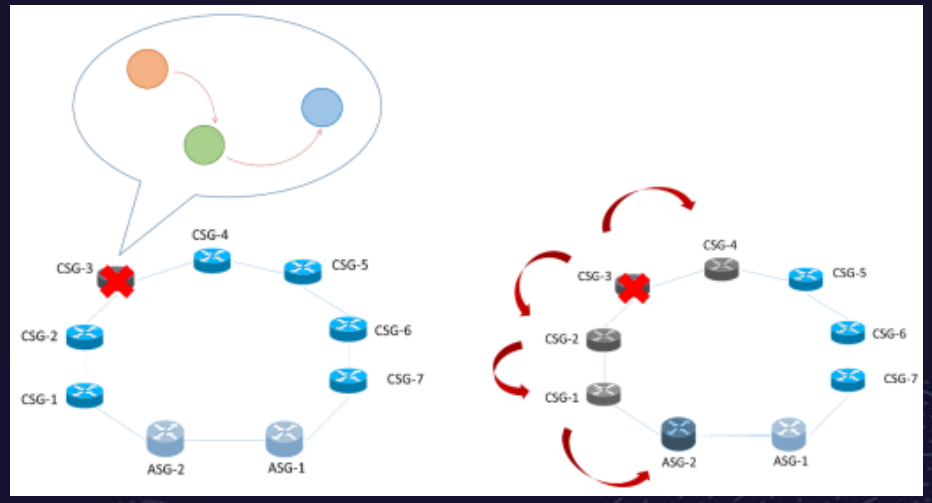
Fault Localization of Loop Network Devices

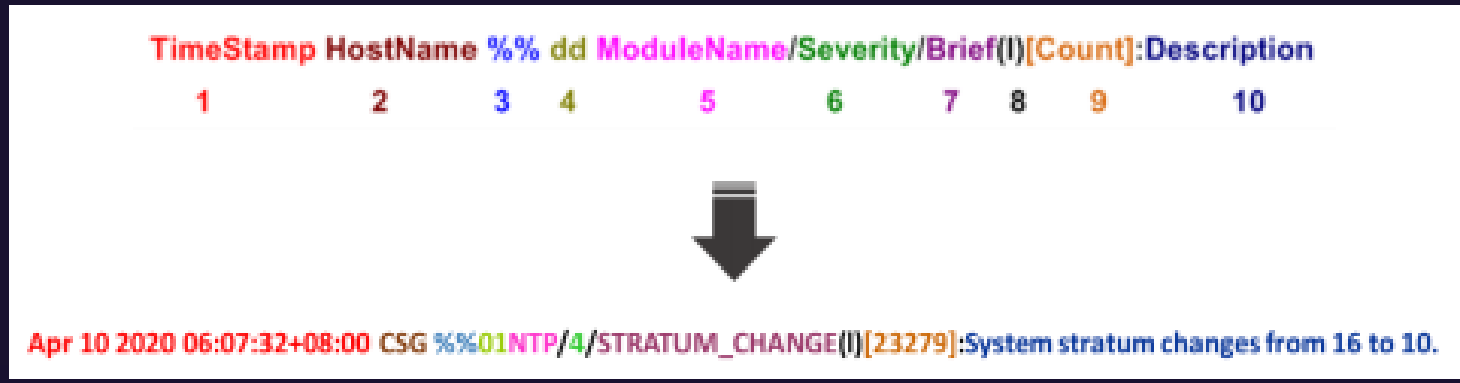
Alarm logs:

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

Fault Localization of Loop Network Devices

Alarm data analyzation

Deal with the alarm log and extract some useful information

Delivery network determination

determine and draw the alarm transmission network

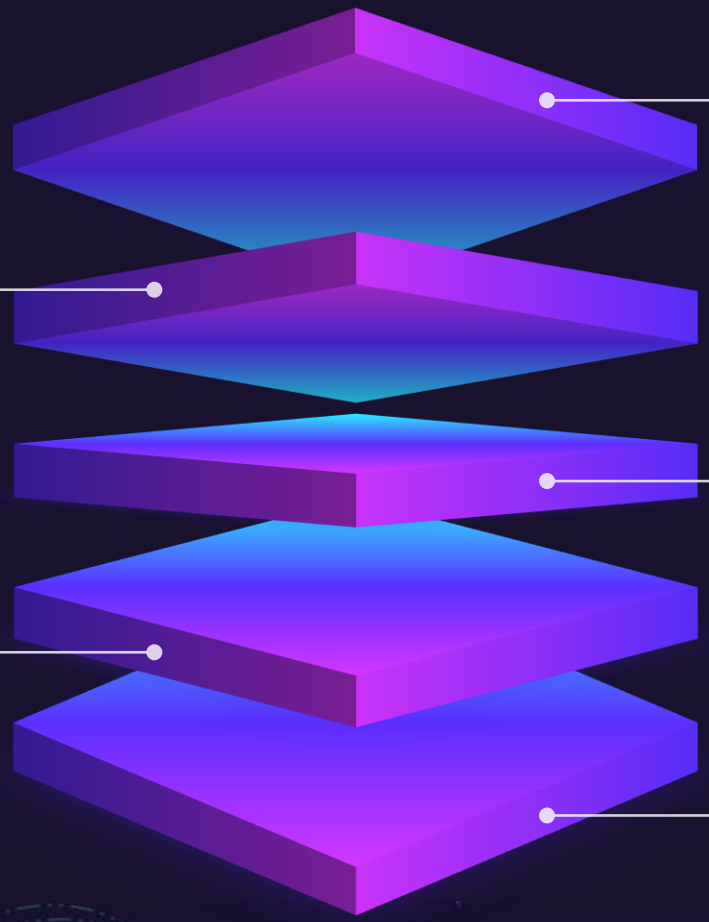
Root alarm determination

determine the root alarm and subordinate alarm

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

- using regularization rules → standard data.
- Add year information.
- Deal with some incomplete data

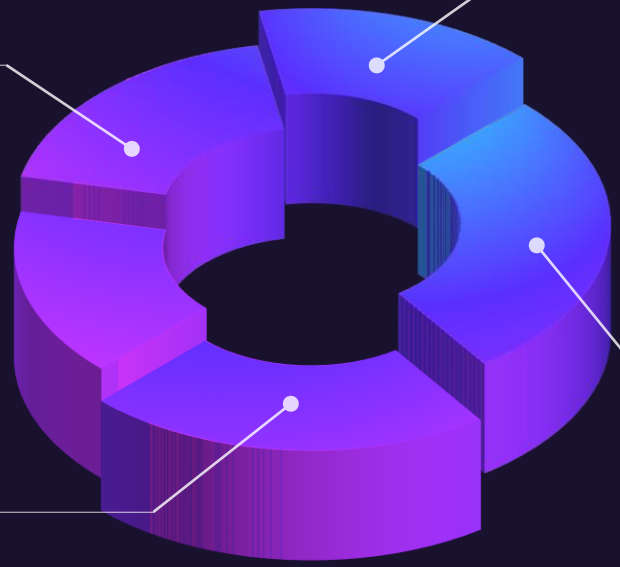
Add brief name

- Use natural language processing
- Extract the first five keywords
- Regularization method

Eliminate alarm

- Delete duplicate alarms
- Delete the high frequency data
- Delete low level alarm

Time window planning



time window

The time window is set to 1 minutes

Neighbors

Add own neighbors to each device

Frequent items

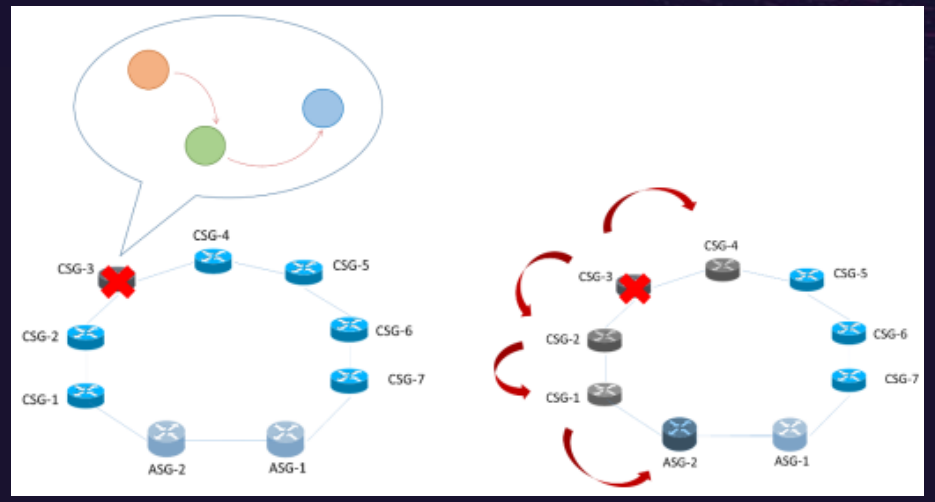
Get frequent items from time window

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.

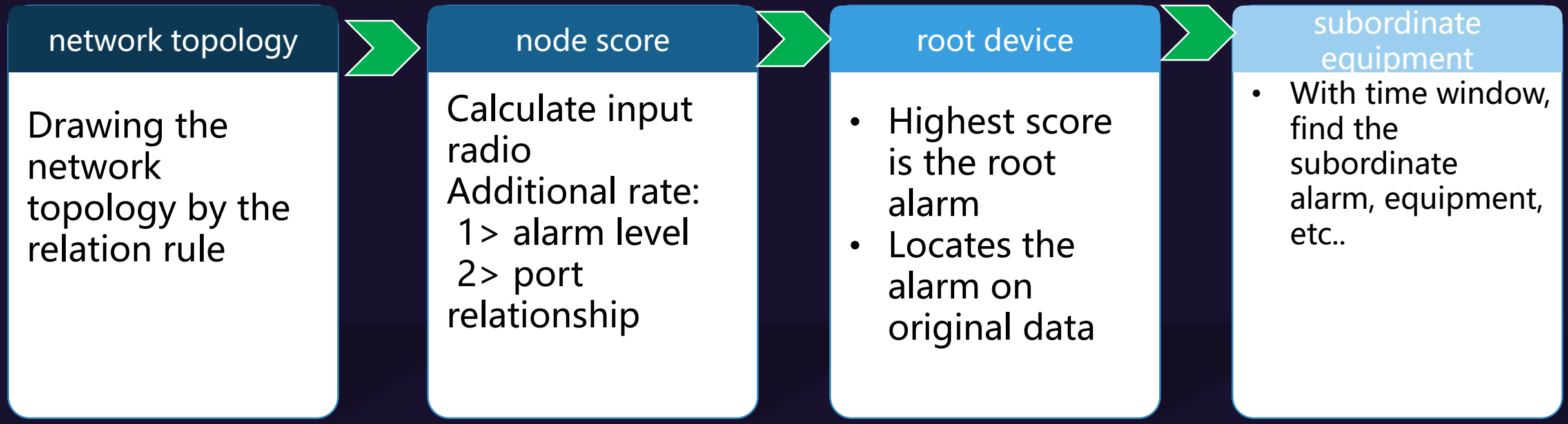


Our method:

- **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

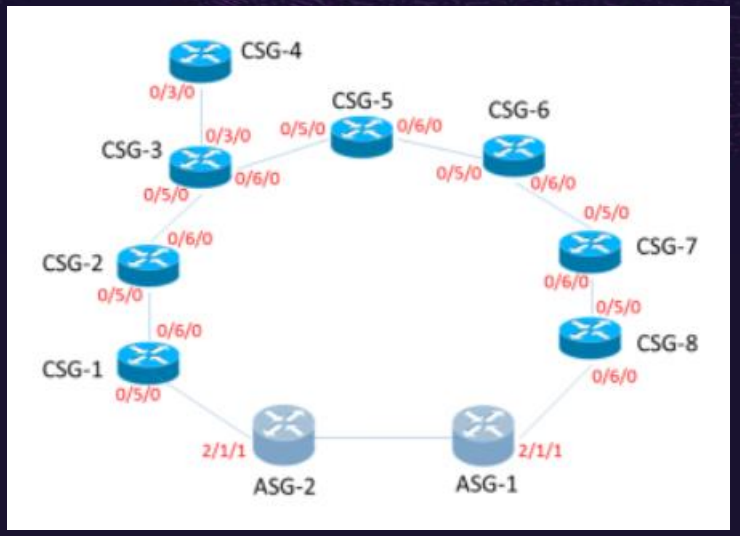
CSG-8&VFS&MIB_OPERATE_PUT_FILE => CSG-8&HWCM&CFGCHANGE

Subordinate alarm



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

The results are showed that:



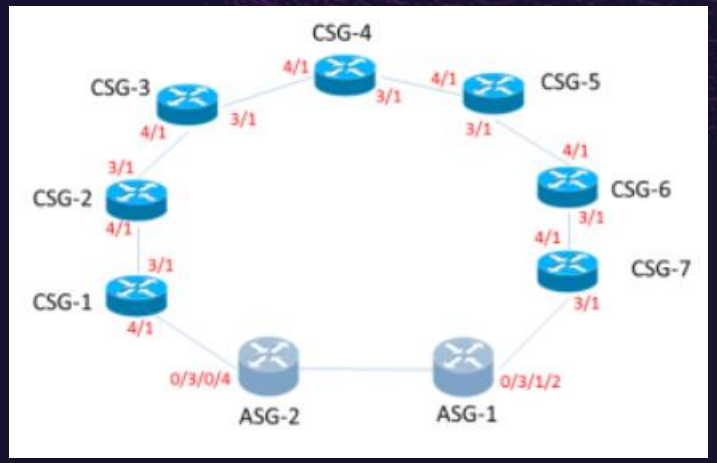
A-dataset:

- 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
5	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...
9	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...
9	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

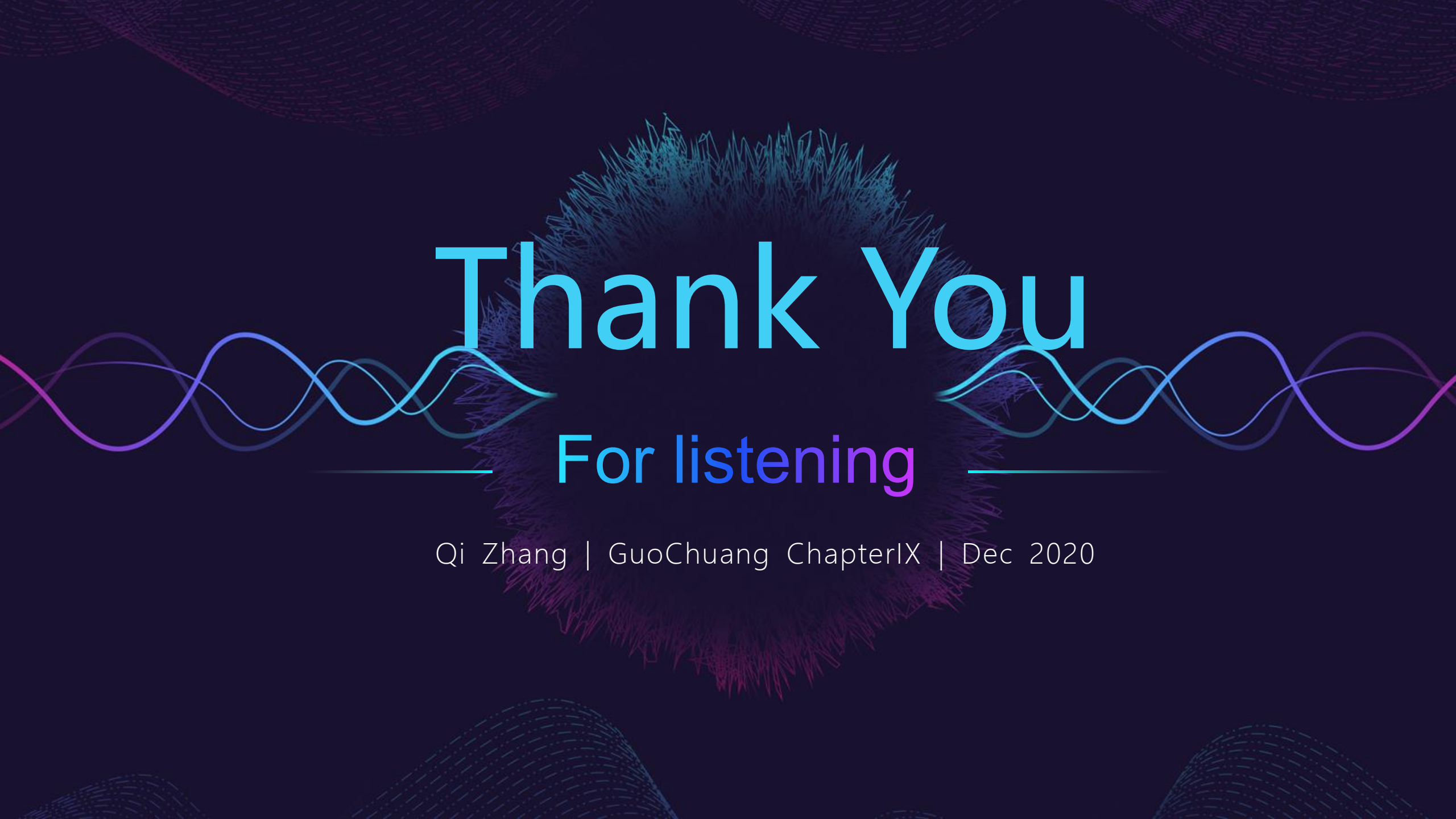
Summary

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.


Thank You
For listening
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