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A survey of cloud network fault diagnostic systems and tools

Key words: Cloud network; Network diagnostics; Network anomaly; Network monitoring

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Motivation

1. Cloud-related technologies have gradually matured and the market of the cloud network is growing quickly.

2. Cloud network breakdown is inevitable, leading to a decrease in the stability and availability. Therefore, the assistance of cloud network diagnostic systems and tools is indispensable.

3. Recently, much research on state-of-the-art cloud network diagnostic systems and tools has been conducted, but there is still a lack of detailed analysis and summary of cloud diagnostic systems and tools.

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What is cloud diagnostics

1. Network diagnostics and monitoring are similar. However, monitoring focuses on providing the performance measurement of networks, while diagnostics concentrates on troubleshooting the causes of faults.

2. Although there is no unified definition of network diagnostics in the cloud currently, we definite diagnostics as analyzing data from the production cloud network and gaining a certain degree of insight into the network failure.

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State-of-the-art cloud diagnostics systems and tools

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1. We analyze cloud diagnostic systems and tools into five categories, including network scenarios, failure symptoms, problems to solve, data types, and data collection methods.

2. We list and briefly describe the state-of-the-art cloud diagnostics systems and tools proposed in recent years and classify them according to the five categories.

Differences between the cloud and traditional network diagnostics

1. Cloud diagnostics should adapt to the challenges brought by virtualization technology, such as changes of the data plane of packet forwarding.
2. Cloud diagnostics should provide services for abundant cloud applications instead of a single application.
3. Cloud diagnostics should provide services for multiple tenants.
4. Cloud diagnostics should adapt to the capricious flow model brought by the elastic characteristics of the cloud.
5. Cloud diagnostics should use the convenience brought by the centralized control characteristics of the cloud.

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Design requirements of cloud diagnostics

1. Cloud network diagnostic systems and tools should be responsive, or even in (nearly) real time to figure out the faults, so that faults can be quickly eliminated.

2. Cloud network diagnostic systems and tools should not impact the performance of the actual production networks.

3. Cloud network diagnostic systems and tools should have the ability to adapt to different network scenarios.

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Challenges and future development

1. Cloud diagnostics is preferred to be in-band and in the data plane.

2. The state-of-the-art technologies should be deployed, such as stream computing, big data, and artificial intelligence (AI).

3. Analyzing only traffic data is proved to be not enough, and the information of the transport layer should be given more attention because it will show the quality of traffic.

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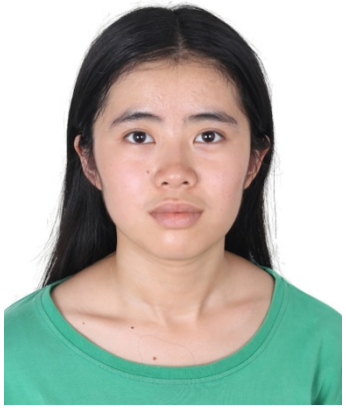

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