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Automatic Traffic Scheduling for Internet Connectivity Failures

Liuqing Zhang



About me

- Liuqing Zhang

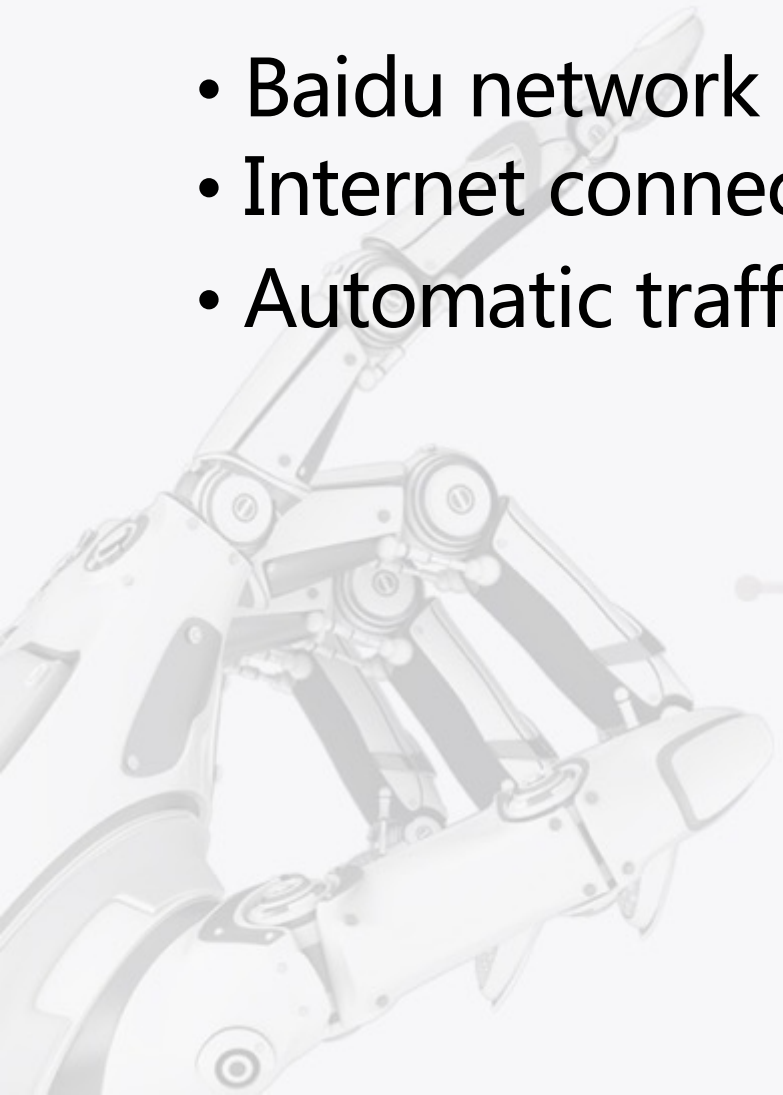
- Staff Software Engineer
- Responsible for Baidu monitoring system.



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Outline

- Baidu network architecture
- Internet connectivity failures detection
- Automatic traffic scheduling



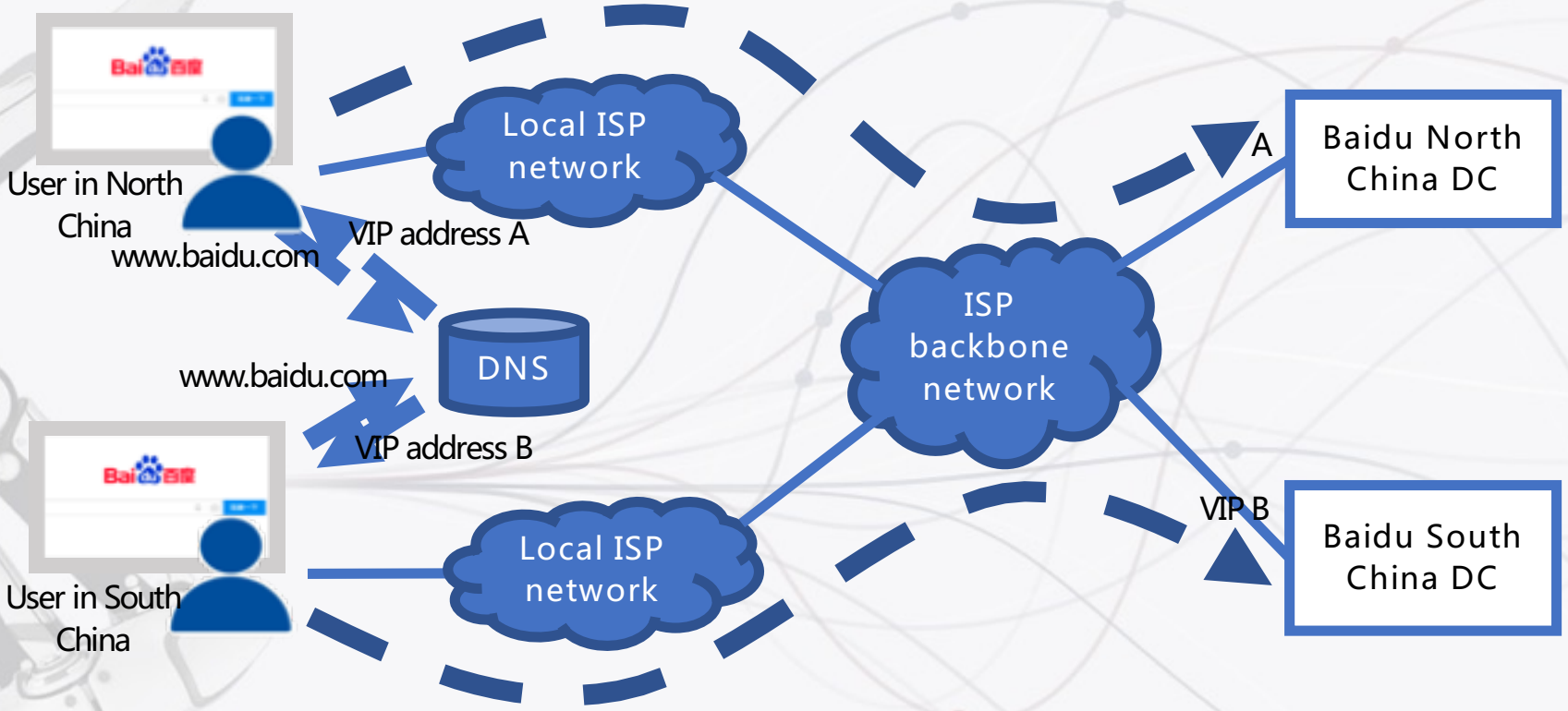
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Two ways to handle the Internet connectivity failures

- Dynamic routing: BGP etc.
  - Automatically solves most of the network failures
  - Expensive
- Traffic scheduling based on DNS
  - Cheap
  - Depends on sufficiently accurate failure detection and traffic scheduling.

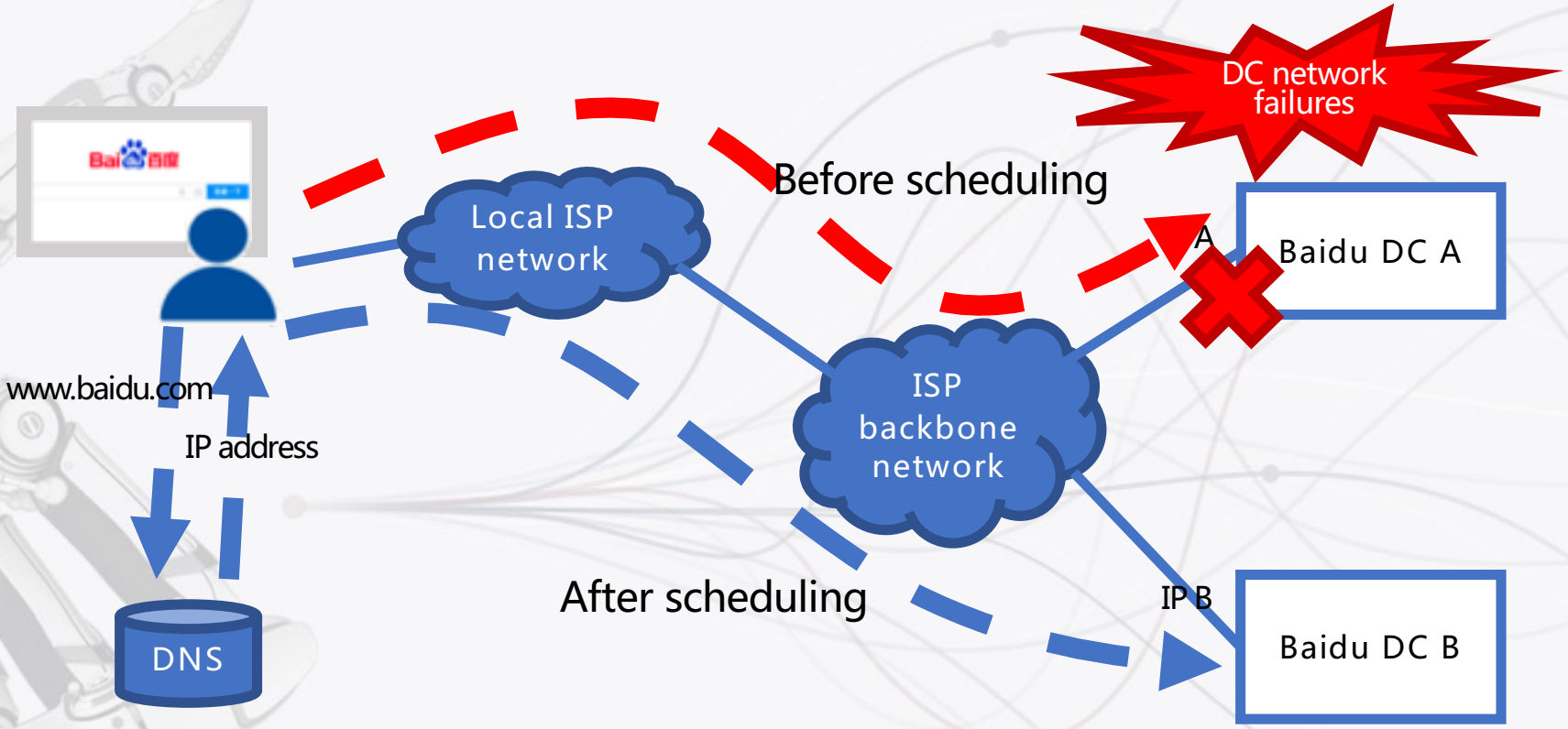
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Baidu network architecture



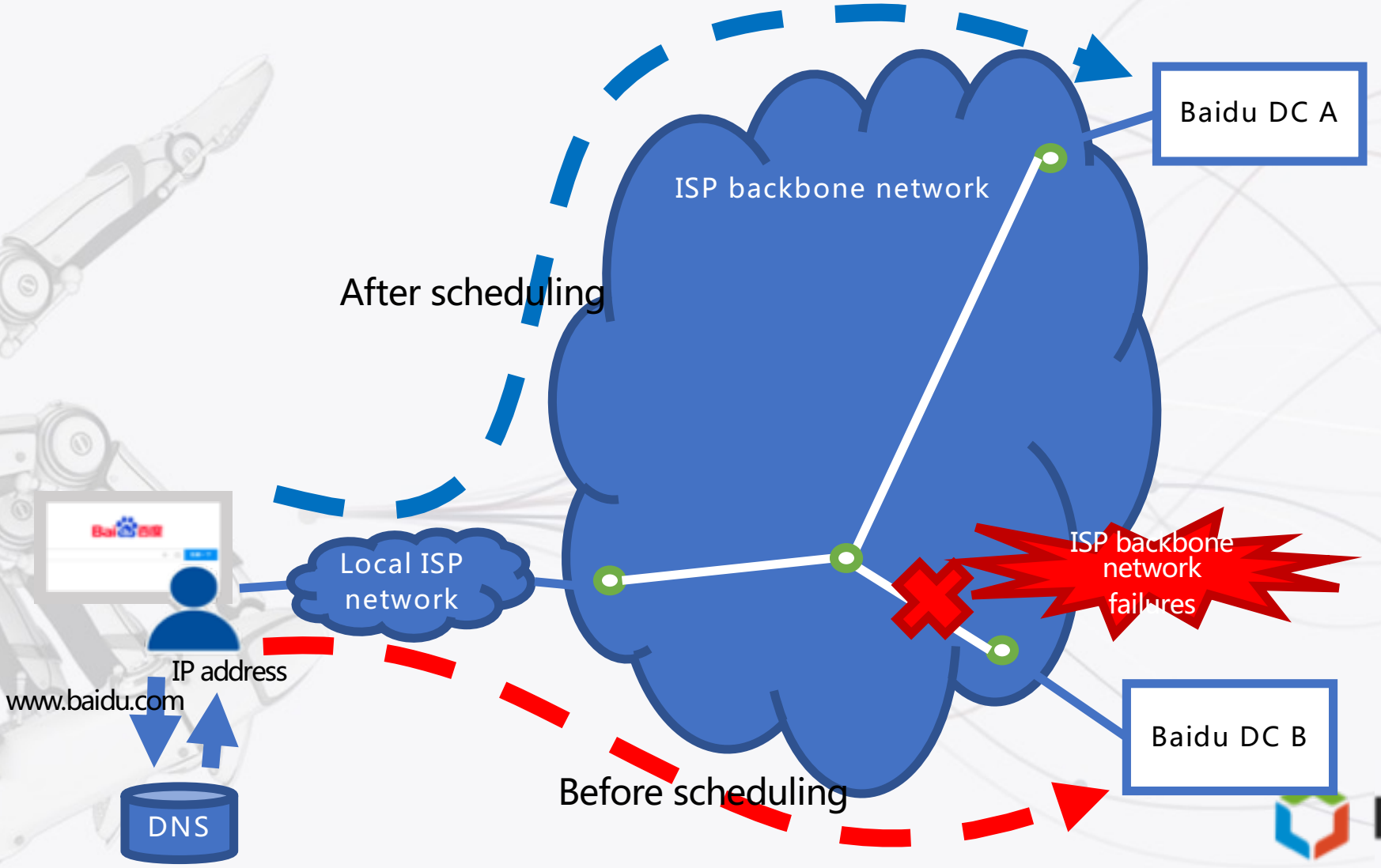
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Data center PoP(point of presence) network failures



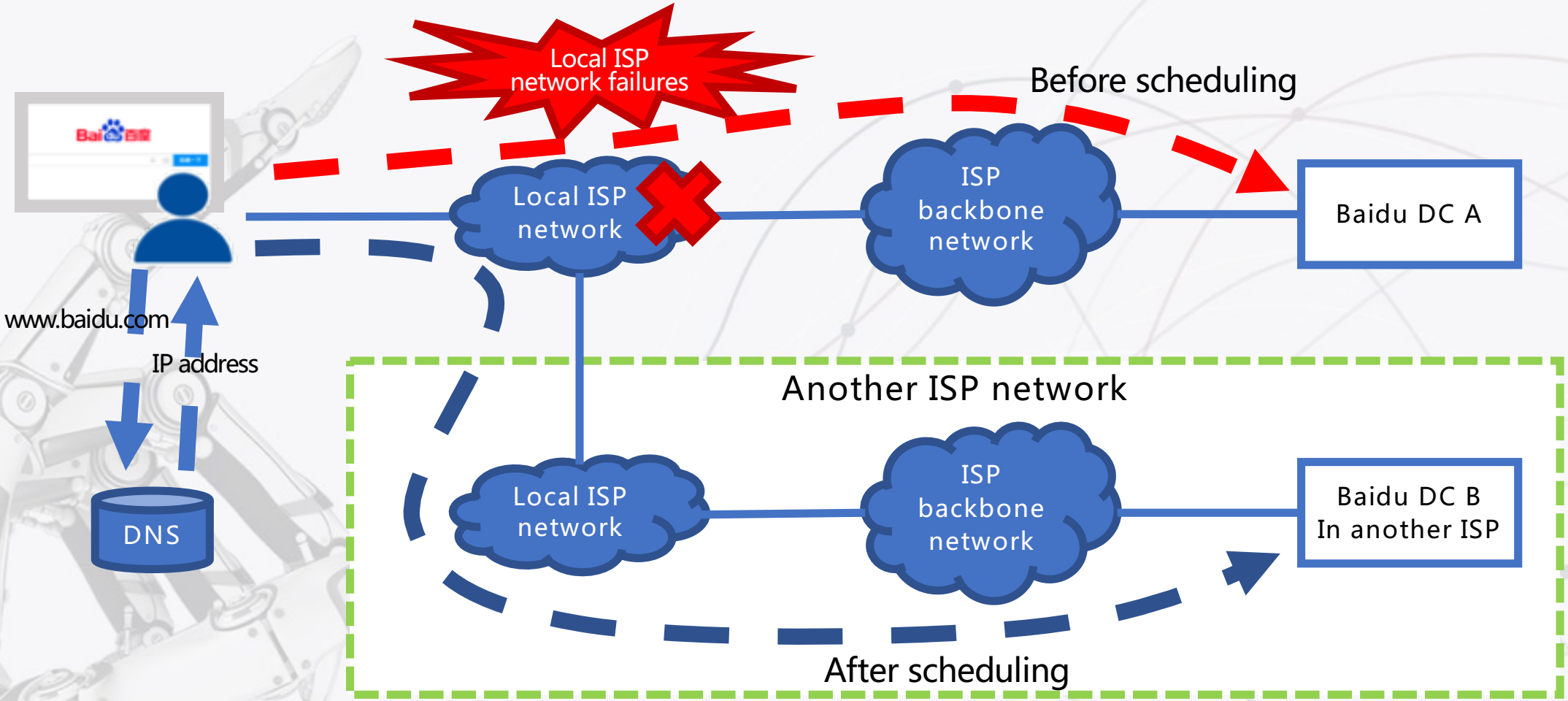
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ISP backbone network failures



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Local ISP network failures



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The impact of Internet connectivity failures

- Internet connectivity failures occurs more than 30 times per month

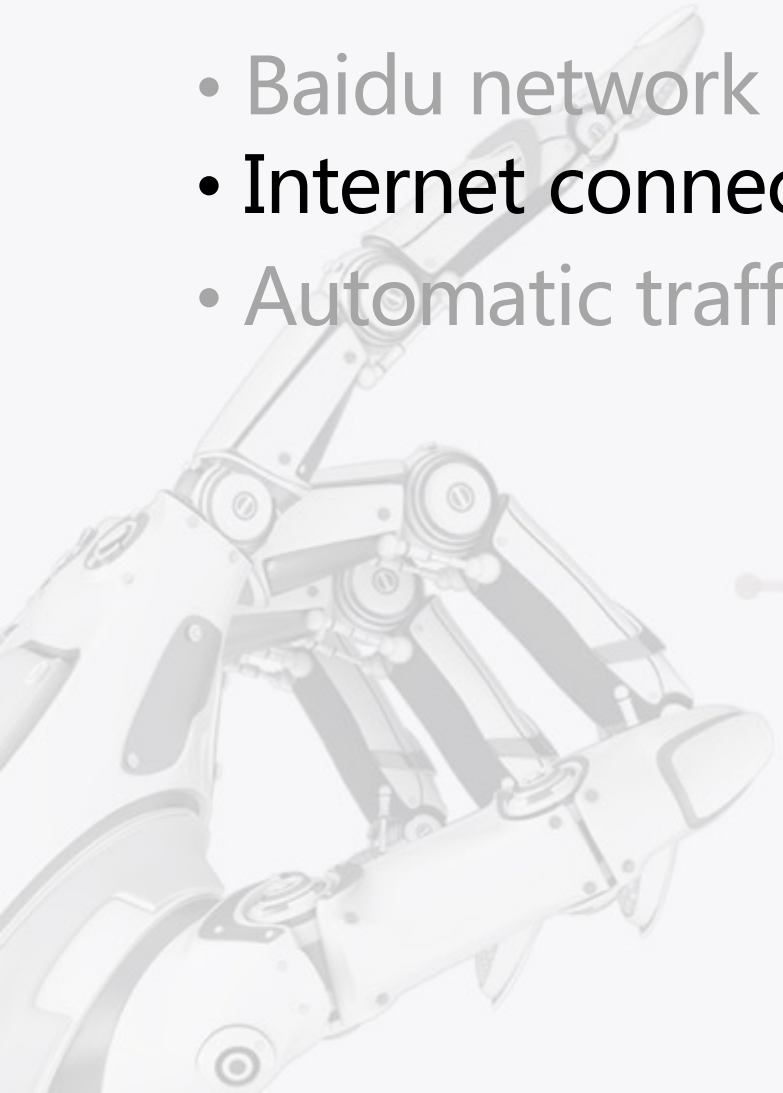
	Times per month	Average duration
Data center PoP network failures	12 – 20 times	1 hour 10 min
ISP backbone network failures	0 – 1 times	2 hour 40 min
Local ISP network failures	20 – 30 times	16 min

- Recovery time by manual operation
  - > 30 min

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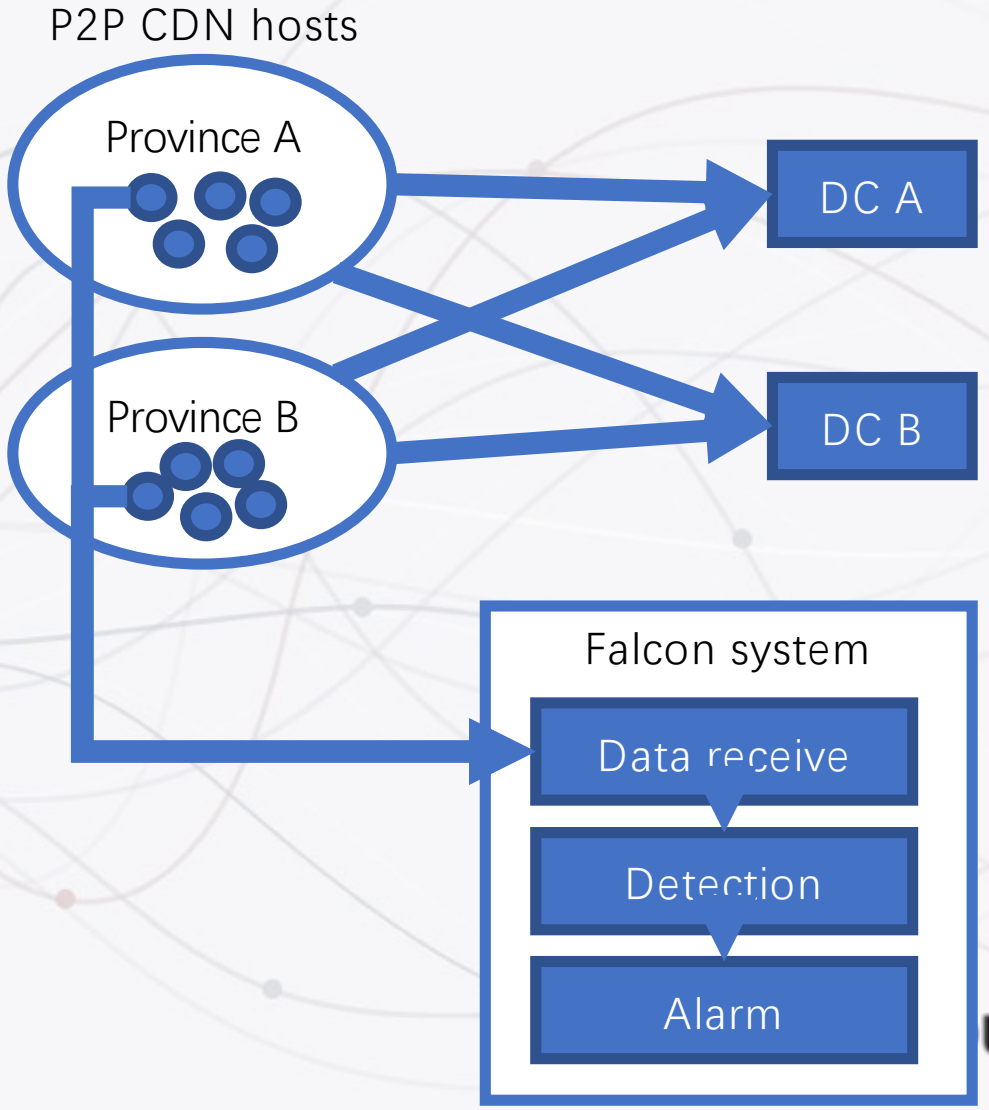


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How to detect these failures

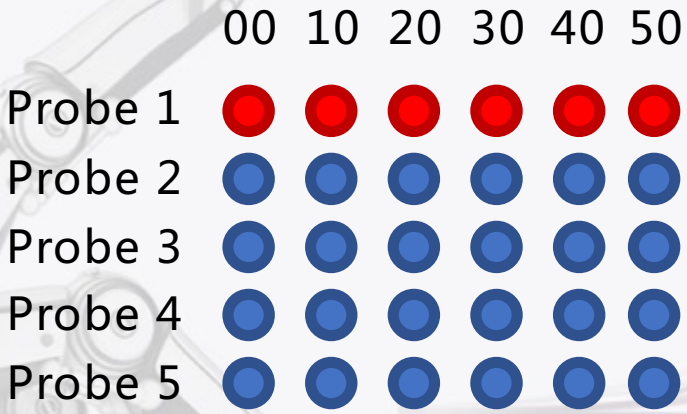
- ***Falcon:*** a network monitoring system

- Coverage is important. > 300 probes are required.
- Using Baidu P2P CDN host.
  - Covered all provinces in China.

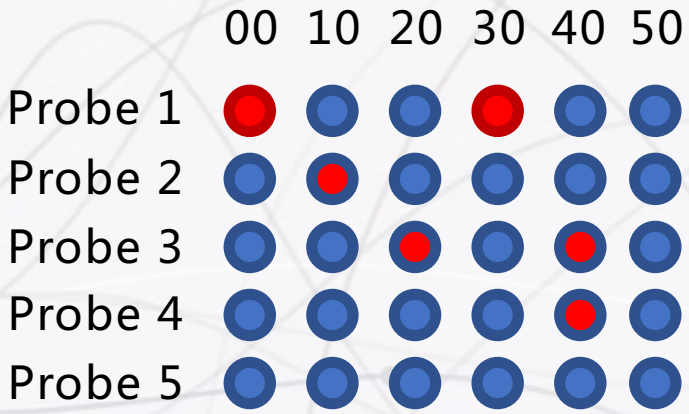


The agent network situation is not stable

- The filter algorithm of abnormal probes



Situation 1:
20% points are abnormal.
There is only 1 detection report that the link is abnormal.



Situation 2:
20% points are abnormal.
There are 4 probes report that the link is abnormal.

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Diagnose the fault location

- <Province, IP>
  - Local ISP network failures
  - ISP backbone network failures
  - Data center PoP network failures



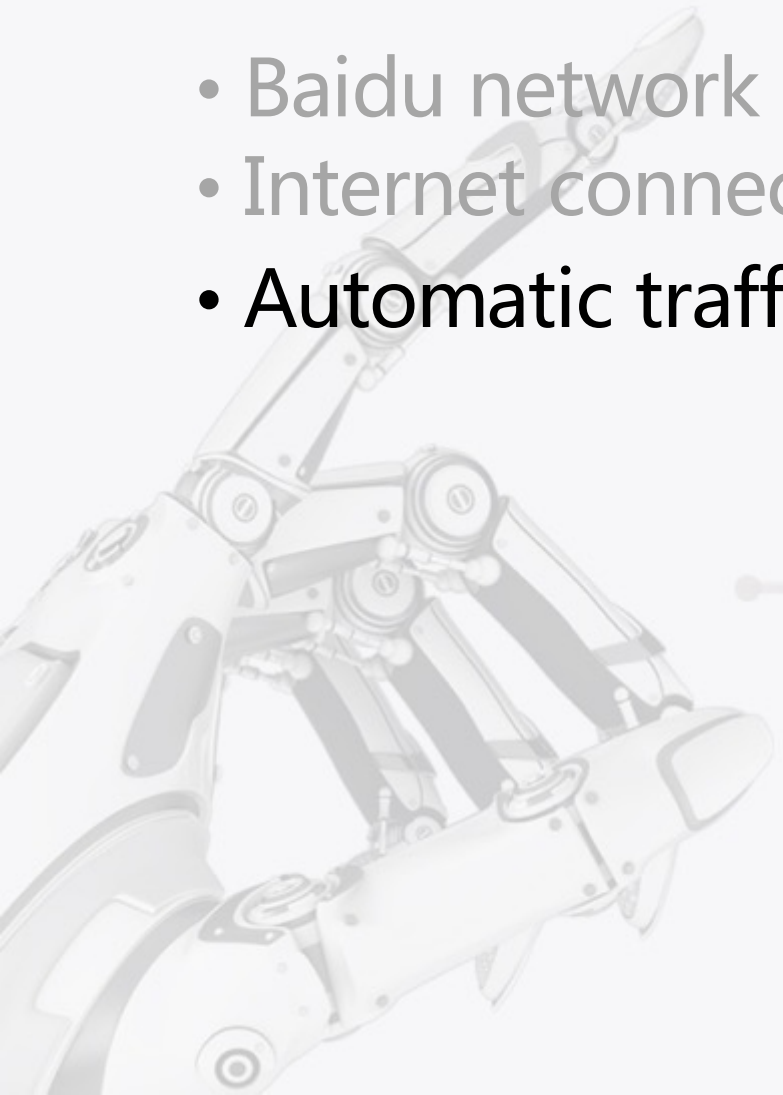
Local province ISP network failures

ISP backbone network failures

Baidu data center network failures

Outline

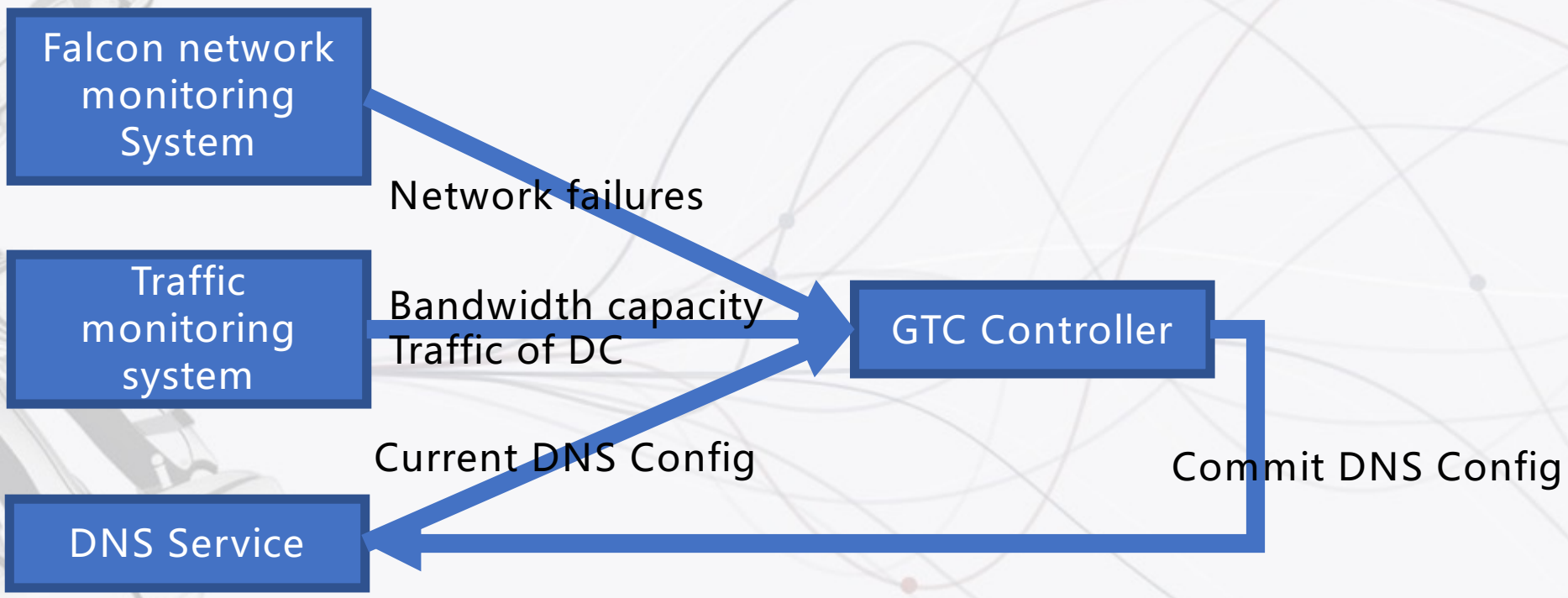
- Baidu network architecture
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- Automatic traffic scheduling



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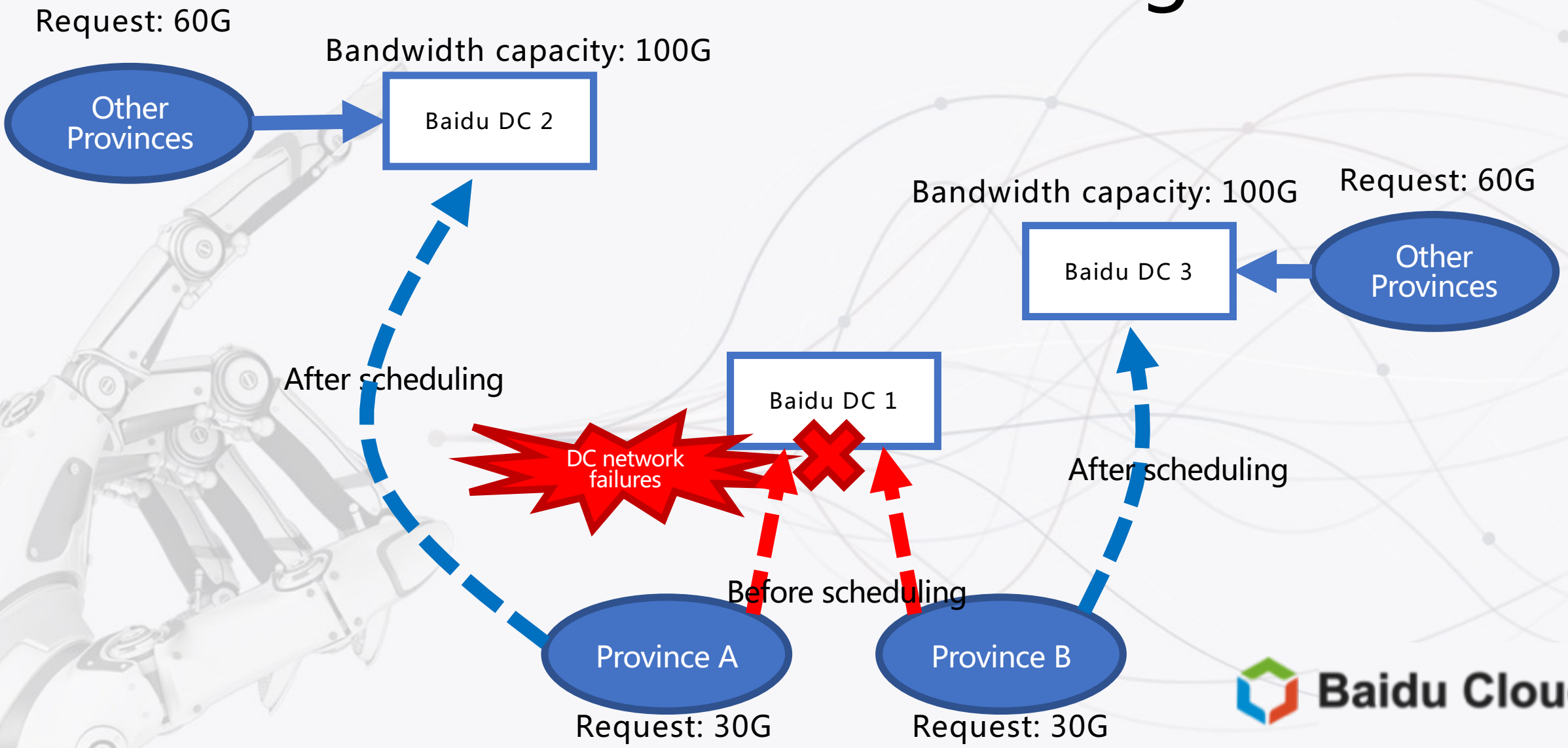
Automatic traffic scheduling

- GTC: the Global Traffic Control system



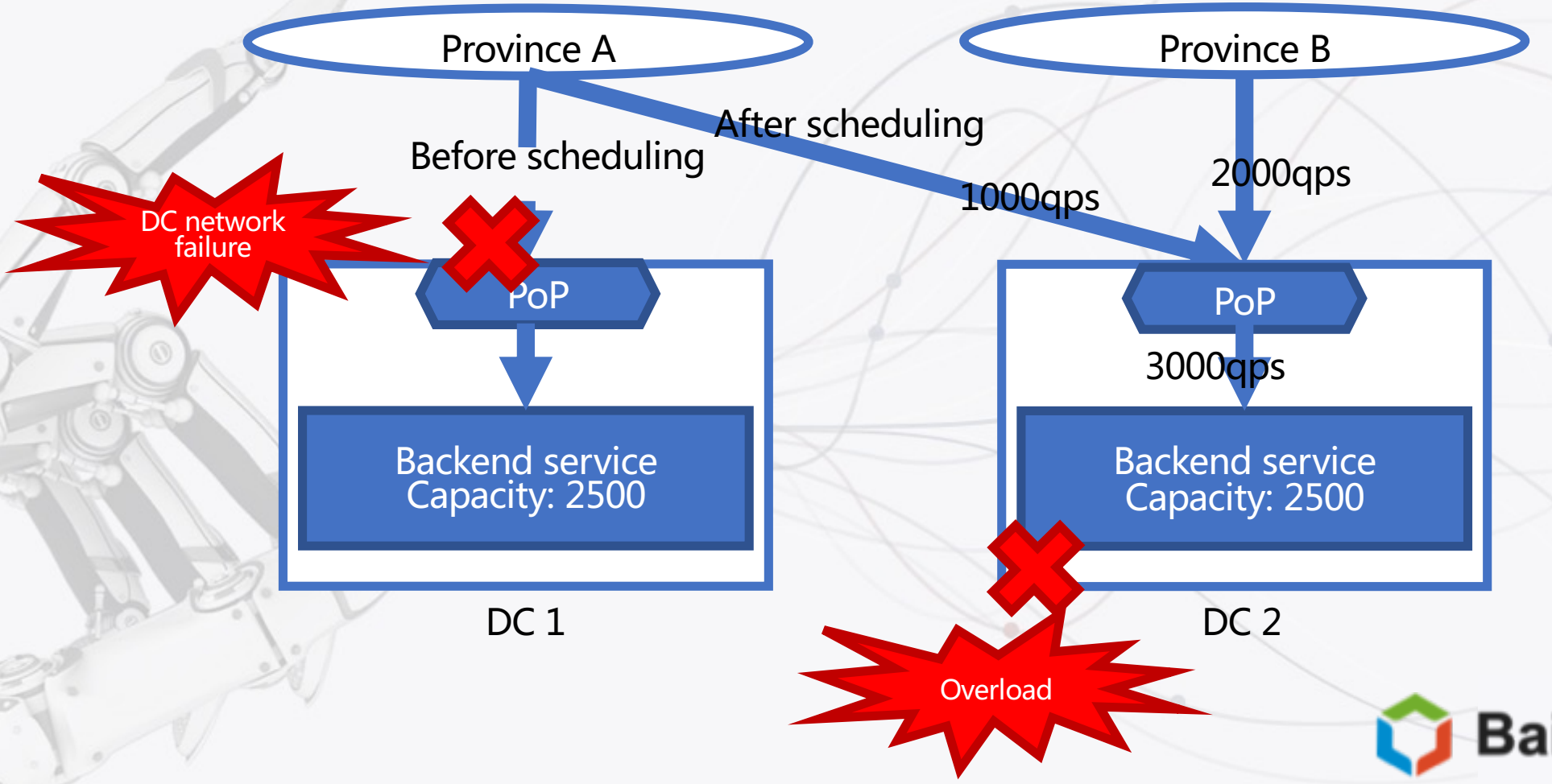
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The result of traffic scheduling



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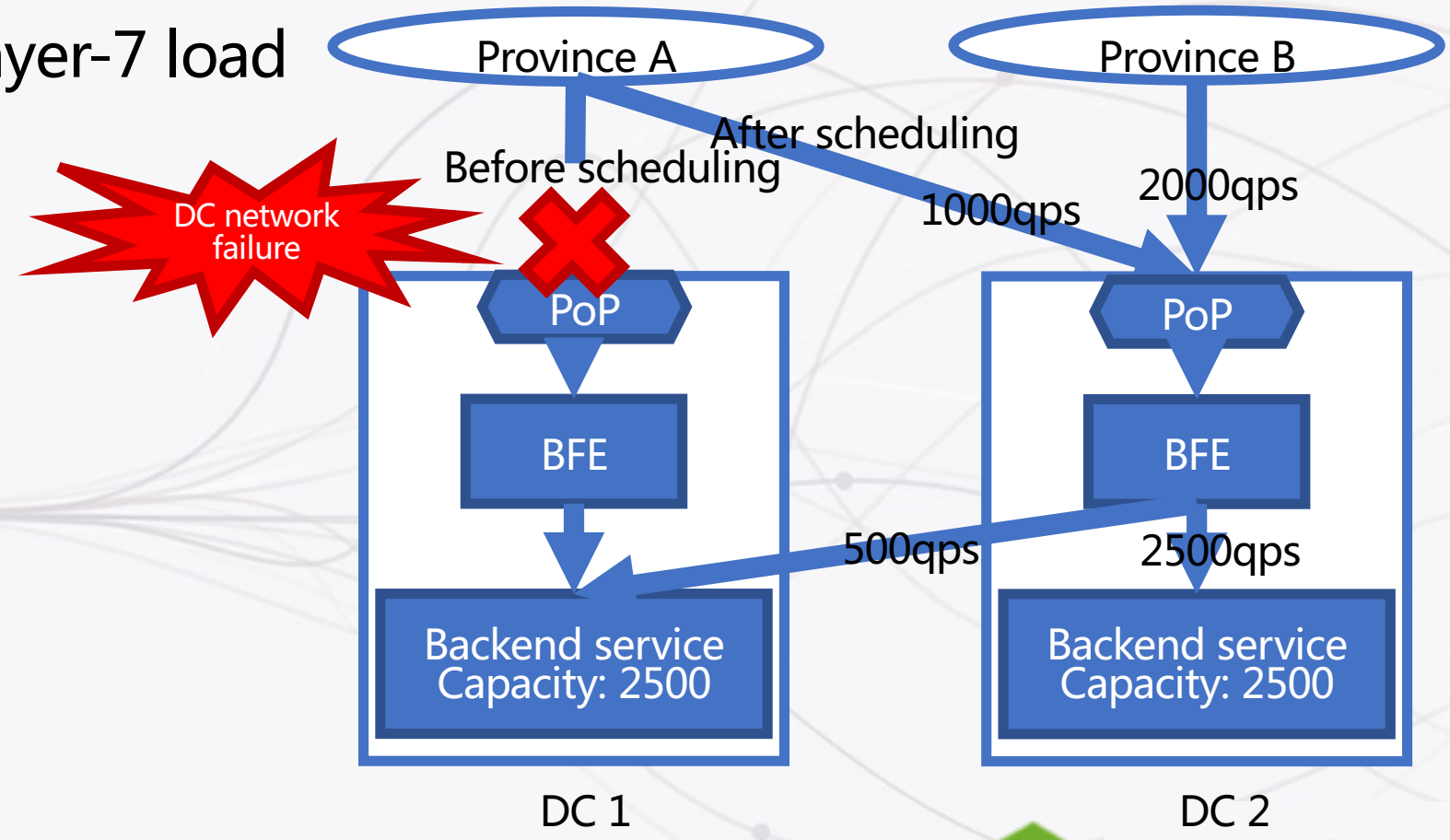
The limit of service capacity



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Capacity of backend service

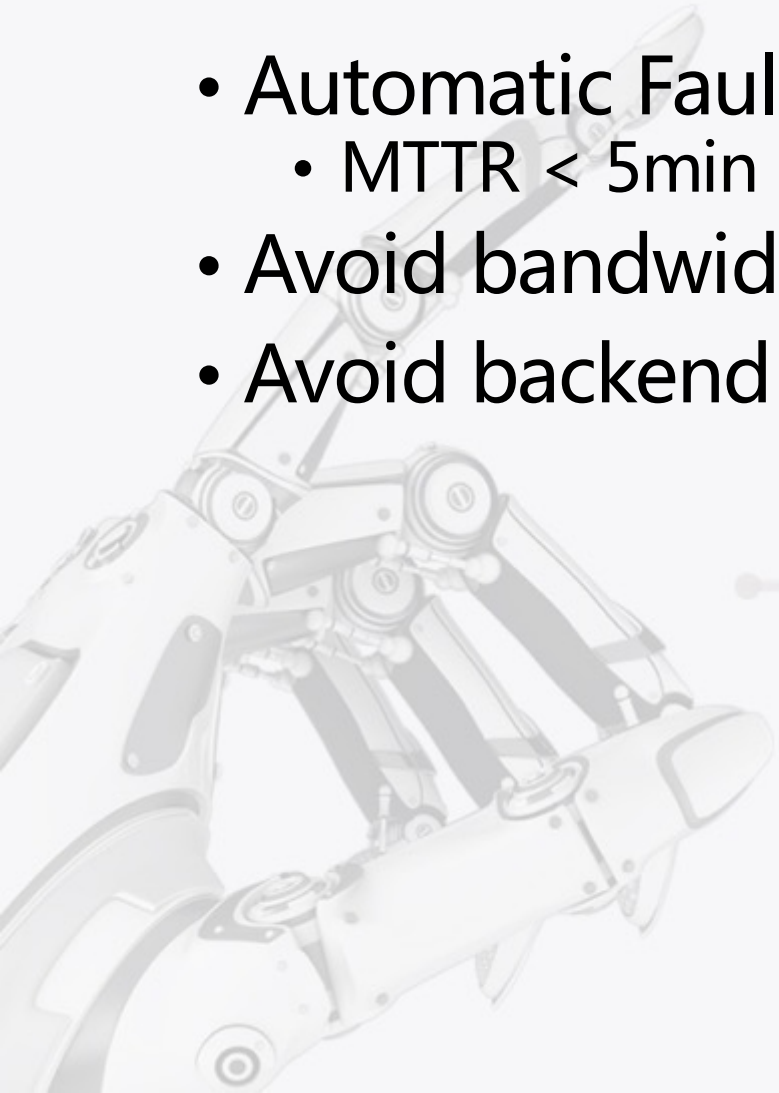
- BFE:
  - Baidu Front-End, a layer-7 load balancer
- Capacity safe



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Benefits

- Automatic Fault Processing
  - MTTR < 5min
- Avoid bandwidth congestion
- Avoid backend service overload



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Thanks



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