

Skype Outage

December 22nd 2010

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The outage

- On December 22th, the Skype network suffered a critical failure.
- The failure lasted approximately 24 hours from December 22, 1600 GMT to December 23, 1600 GMT.
- The failure concerned more than 23 millions of online users.
- On December 29th, the CIO at Skype, Lars Rabbe, published a blog article explaining the outage.

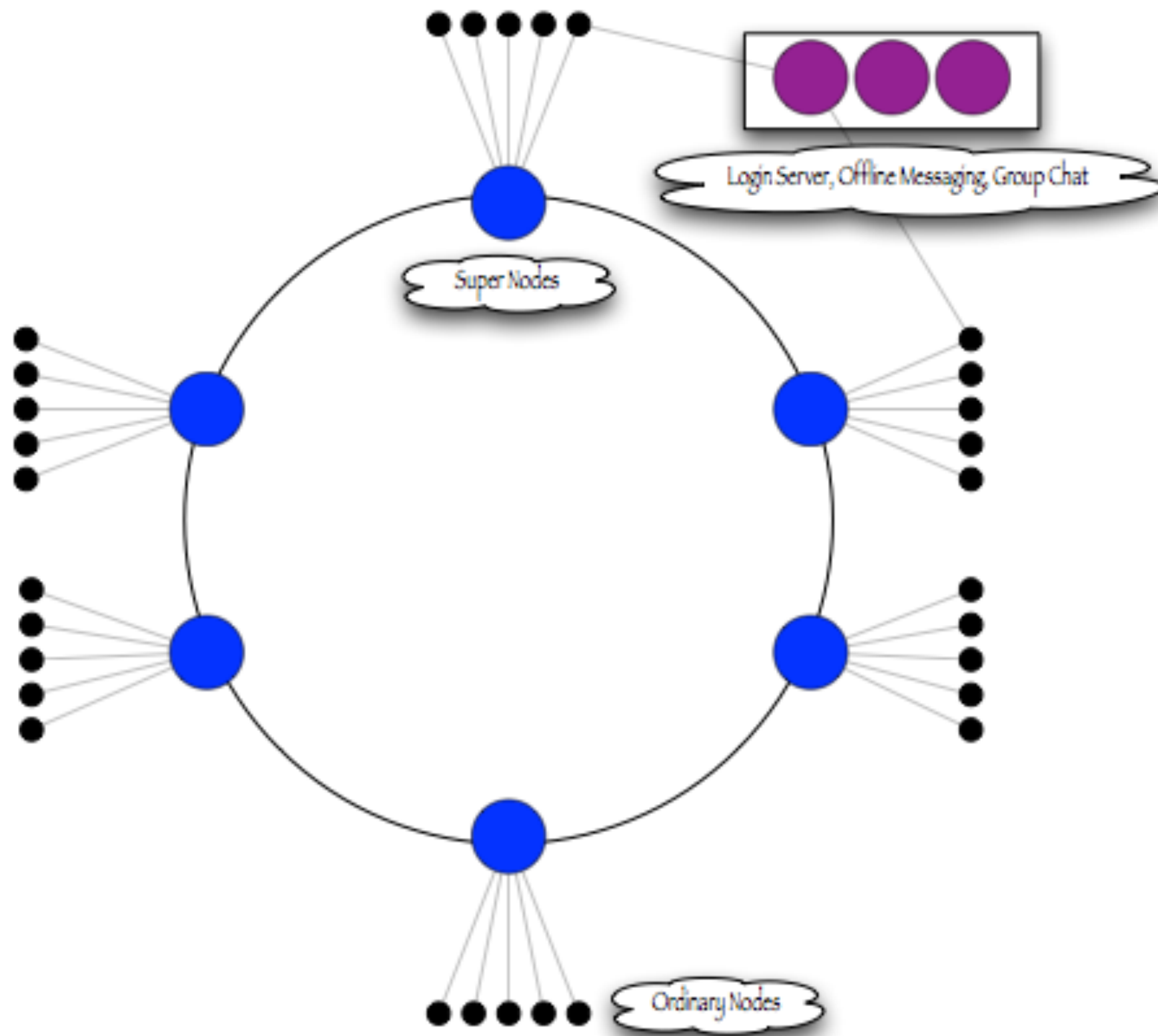
Outline

- A brief introduction to Skype
 - The Skype network.
 - Distributed Hash Tables.
- The outage
 - Causes.
 - Recovery.

Skype - Brief Introduction

- A peer-to-peer VoIP client developed by KaZaa in 2003
- 27 million connected users this morning (1/13/2011).
- Features:
 - work almost seamlessly across NATs and firewalls.
 - good voice quality.
 - end-to-end calls encryption.
 - decentralized user information storage.

Network Topology



Network Nodes

- Login Server: a server, hosted by Skype, responsible for validating Skype connections.
- Super Nodes: nodes with special capabilities, hosted by clients. Responsible for the client connections and the distributed user directory (DHT).
- Ordinary Nodes: usual Skype clients.

Distributed Hash Table (DHT)

- Second generation P2P overlay network (Structured).
- Self-organizing, load balanced, fault tolerant.
- Scalable: guarantees the number of hops to answer a query.
- Simple interface:
 - `store(key, value)`
 - `retrieve(key) : value`
 - `lookup(key)`

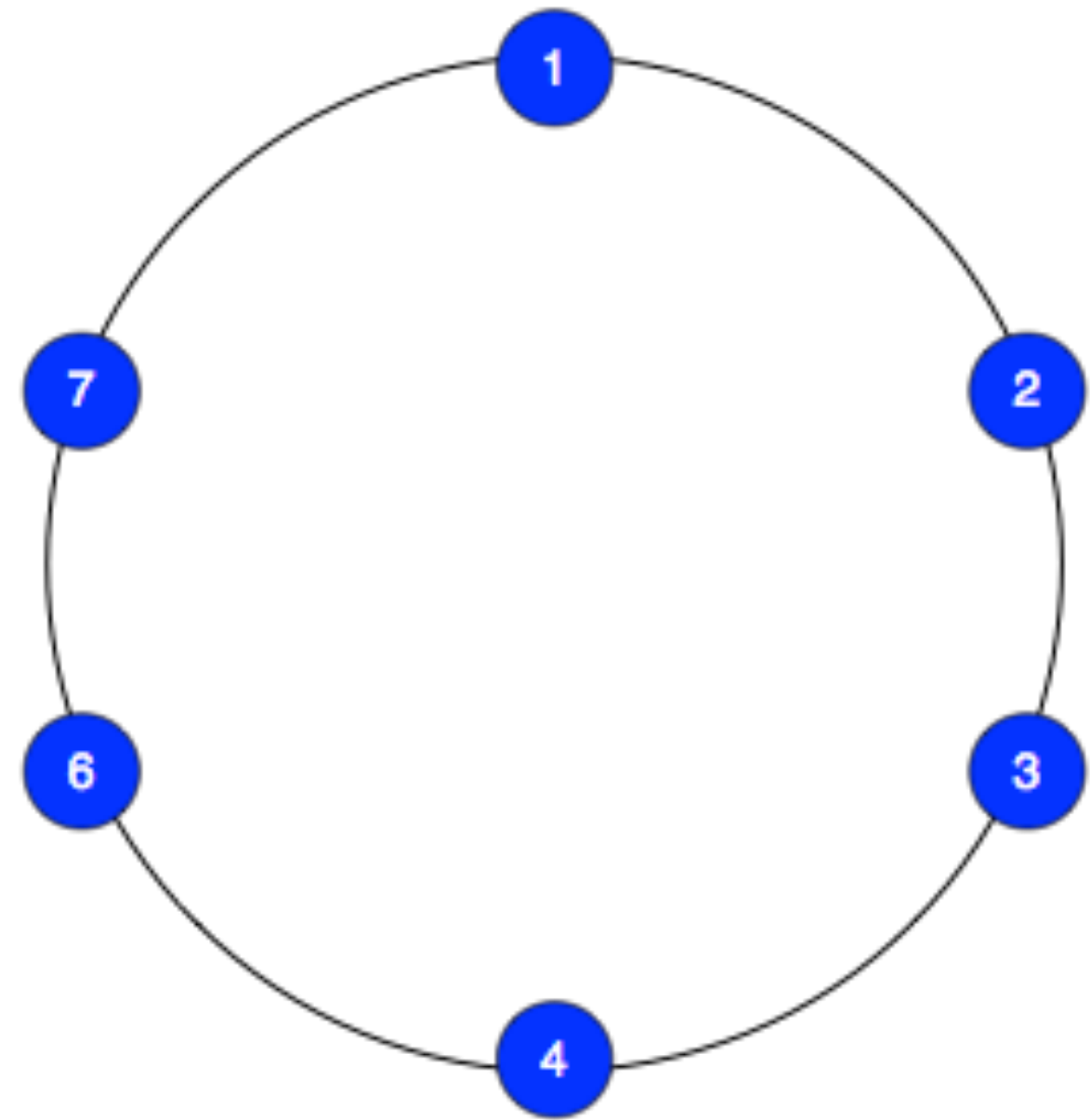
Distributed Hash Table (DHT)

- Based on a hash algorithm: MD, SHA, Tiger, etc.
- Each node is responsible for a range of keys.
- Core operation: find the node responsible for a given key.

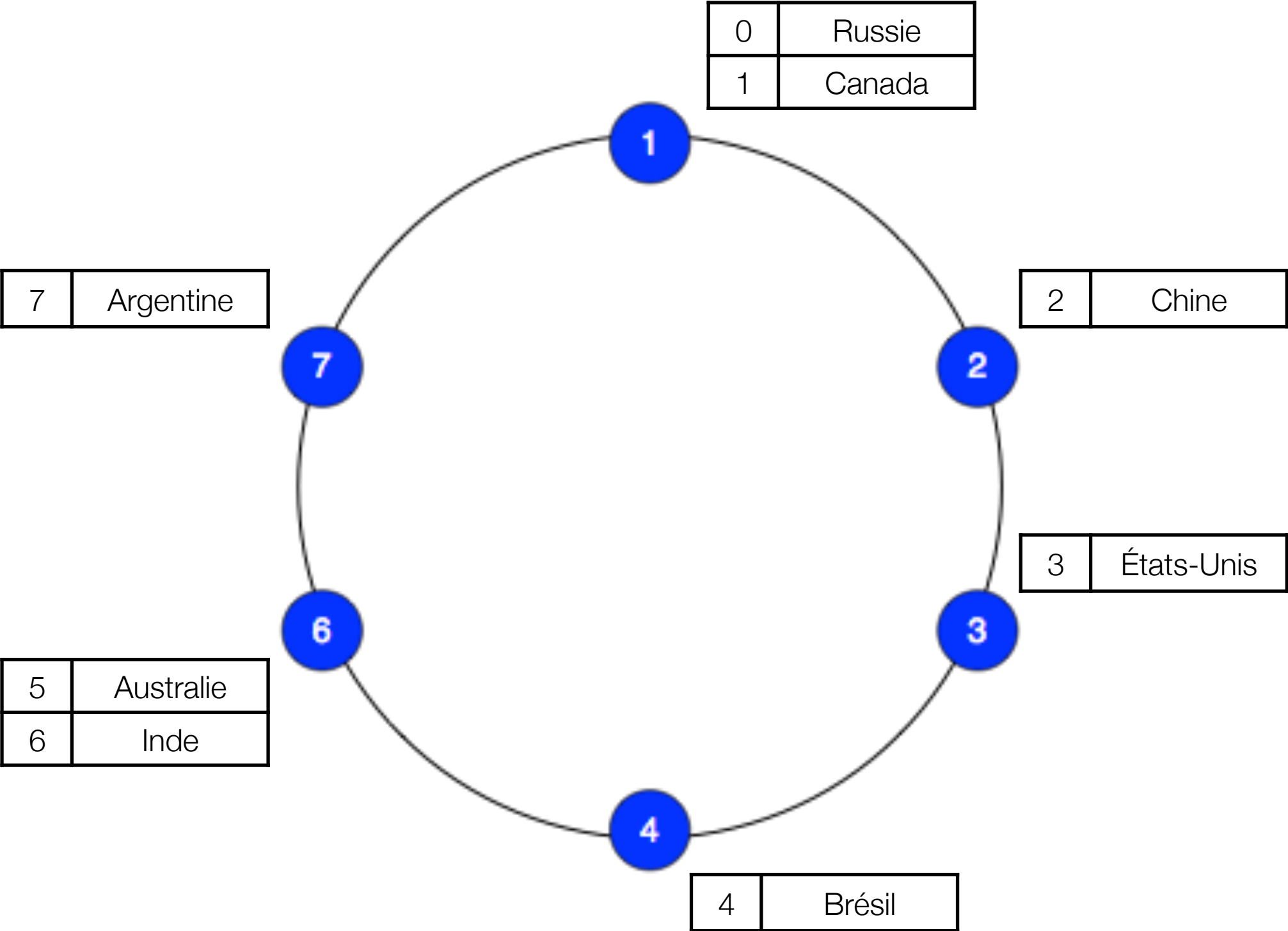
#	Key	Value
0	Russie	17.098.242
1	Canada	9.984.670
2	Chine	9.598.094
3	États-Unis	9.373.967
4	Brésil	8.547.906
5	Australie	7.687.454
6	Inde	3.287.590
7	Argentine	2.766.890

Node ID X Data Mapping

#	Node
0	1
1	1
2	2
3	3
4	4
5	6
6	6
7	7

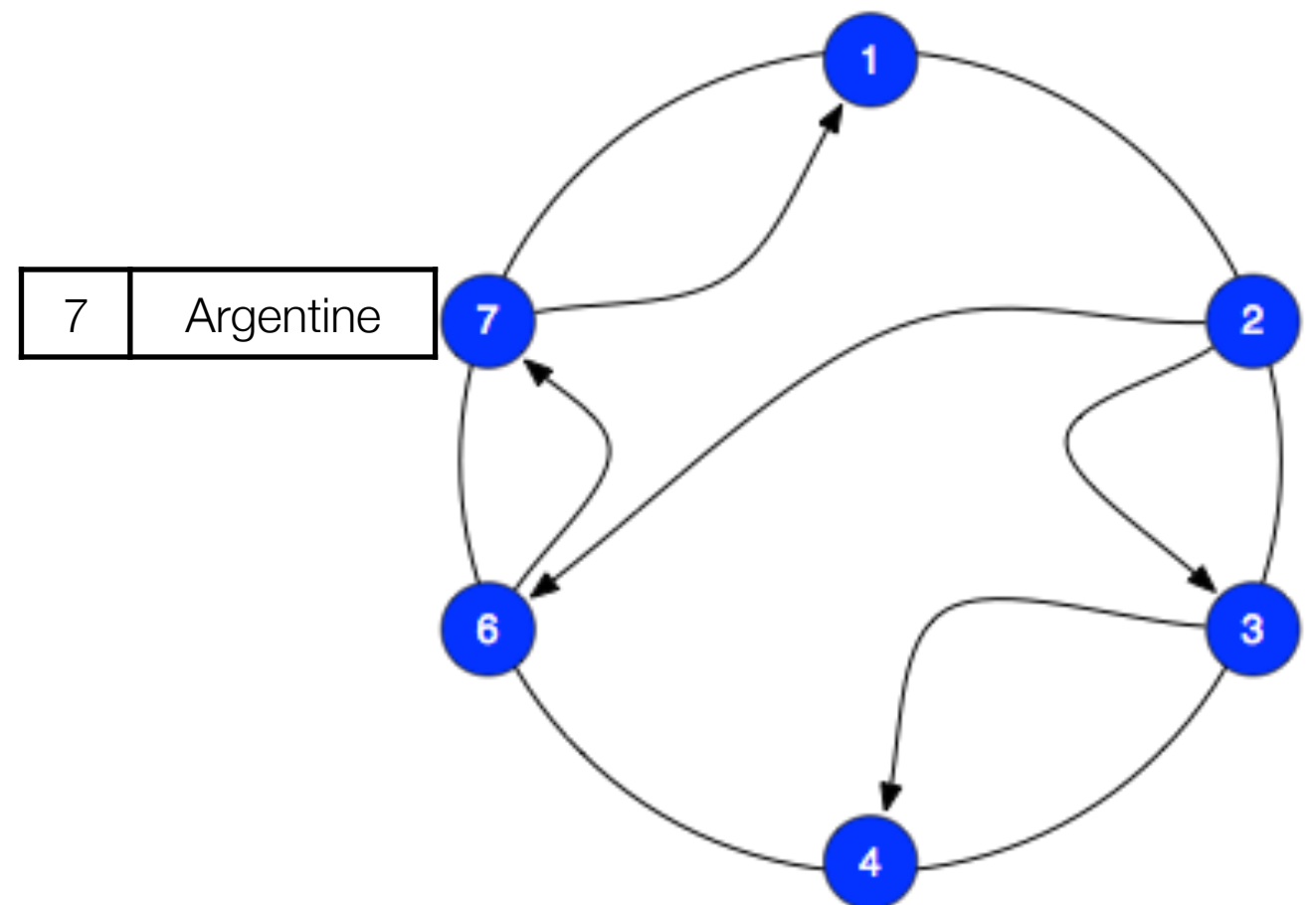


Data Distribution

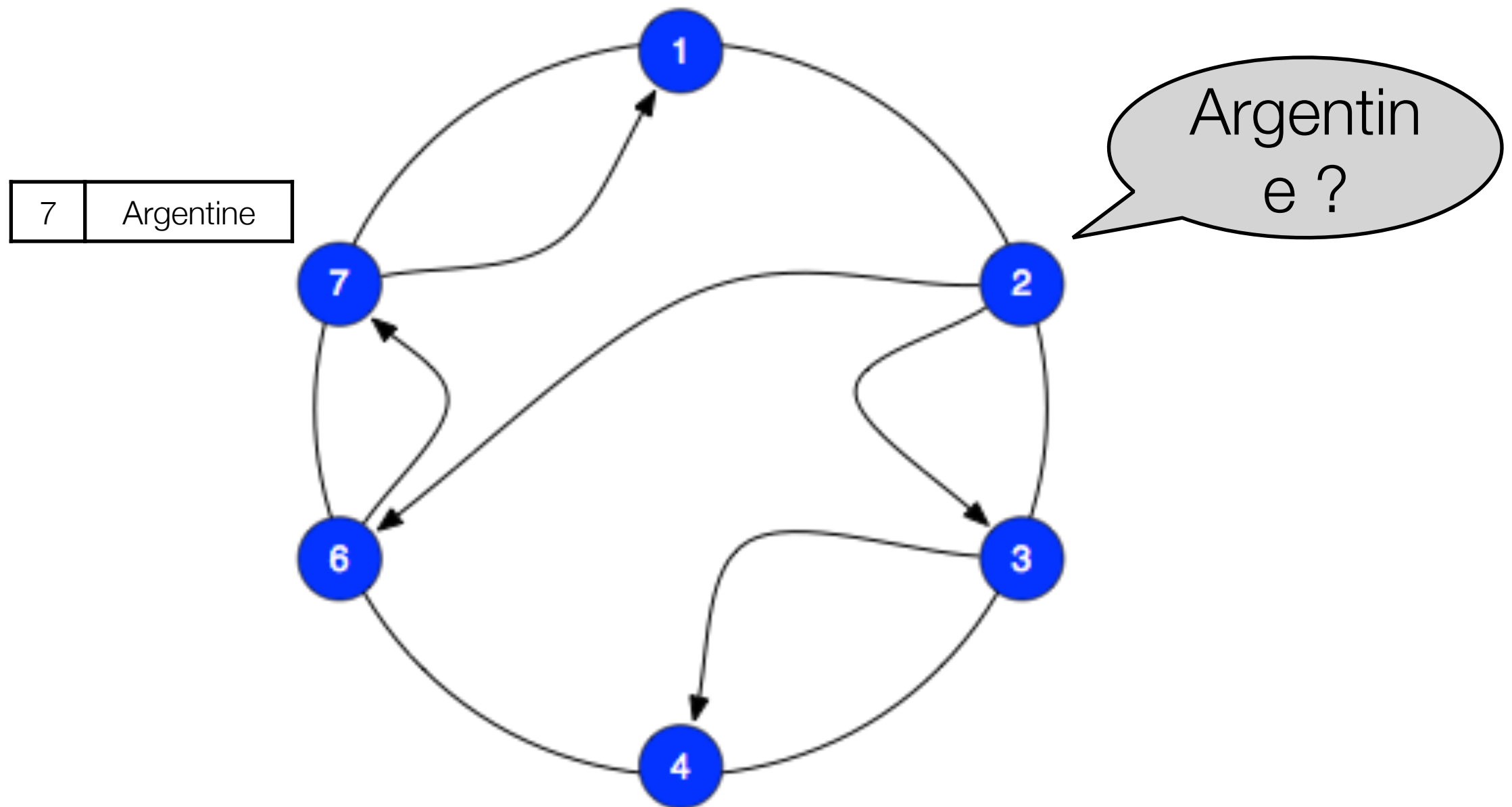


Routing

- 1 node knows all other nodes (centralized).
- All nodes know all other nodes (replication).
- All nodes have a partial view of the whole system.



Routing



Why do we need DHTs ?

- Abstraction:
 - Persistence, volatility, message routing, etc.
- Applications:
 - File systems: Ivy, Farsite, Tahoe.
 - Data sharing: Gnutella index, Skype directory, etc.

The Skype Outage

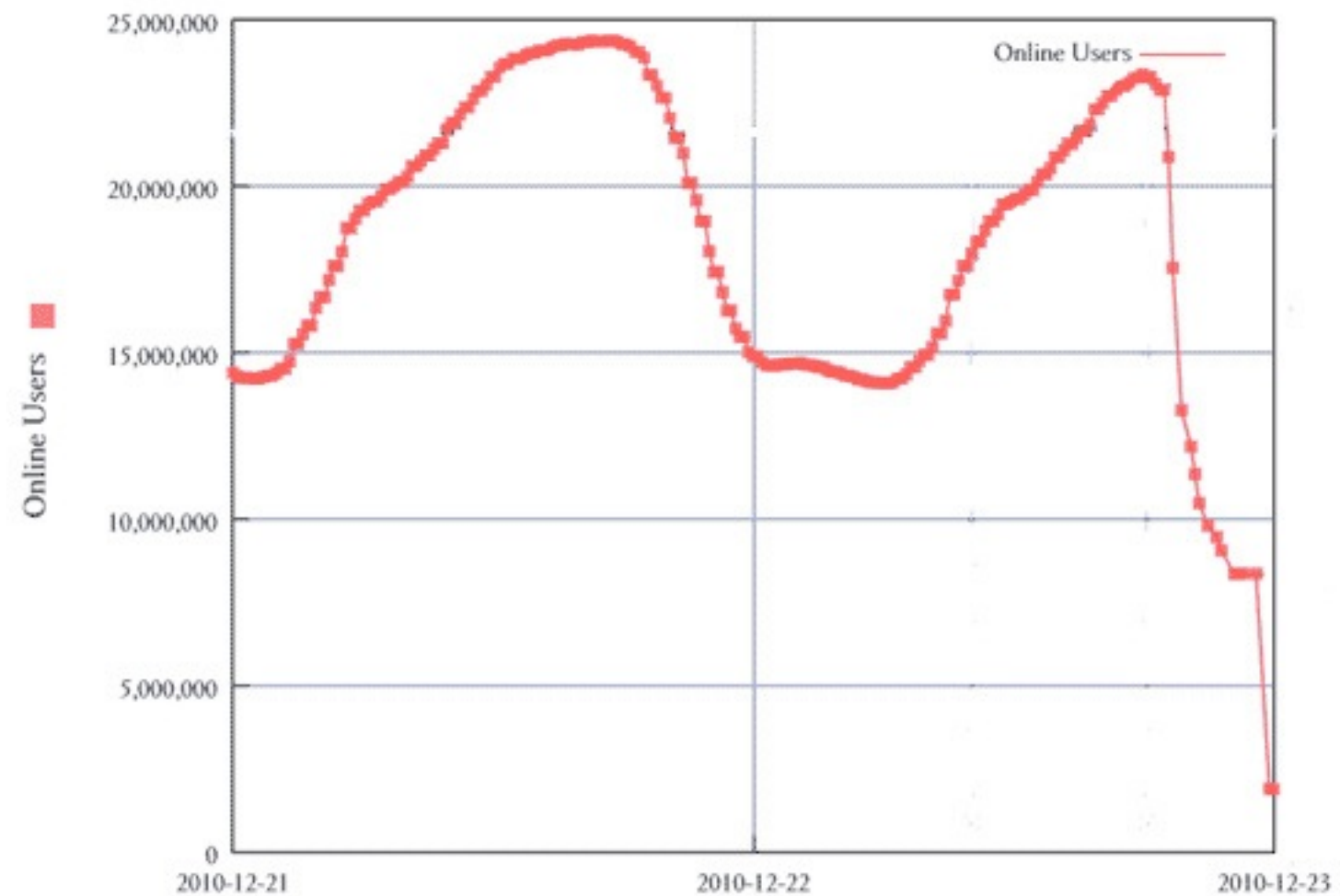
Causes

(1) Overload of cluster, responsible for offline messaging.

(2) The cluster sends delayed responses.

The Skype Network Outage of December 2010

More than 20 million users kicked off Skype's network as signed-in accounts fall from 23.3 million to fewer than 1.6 million in a few hours.

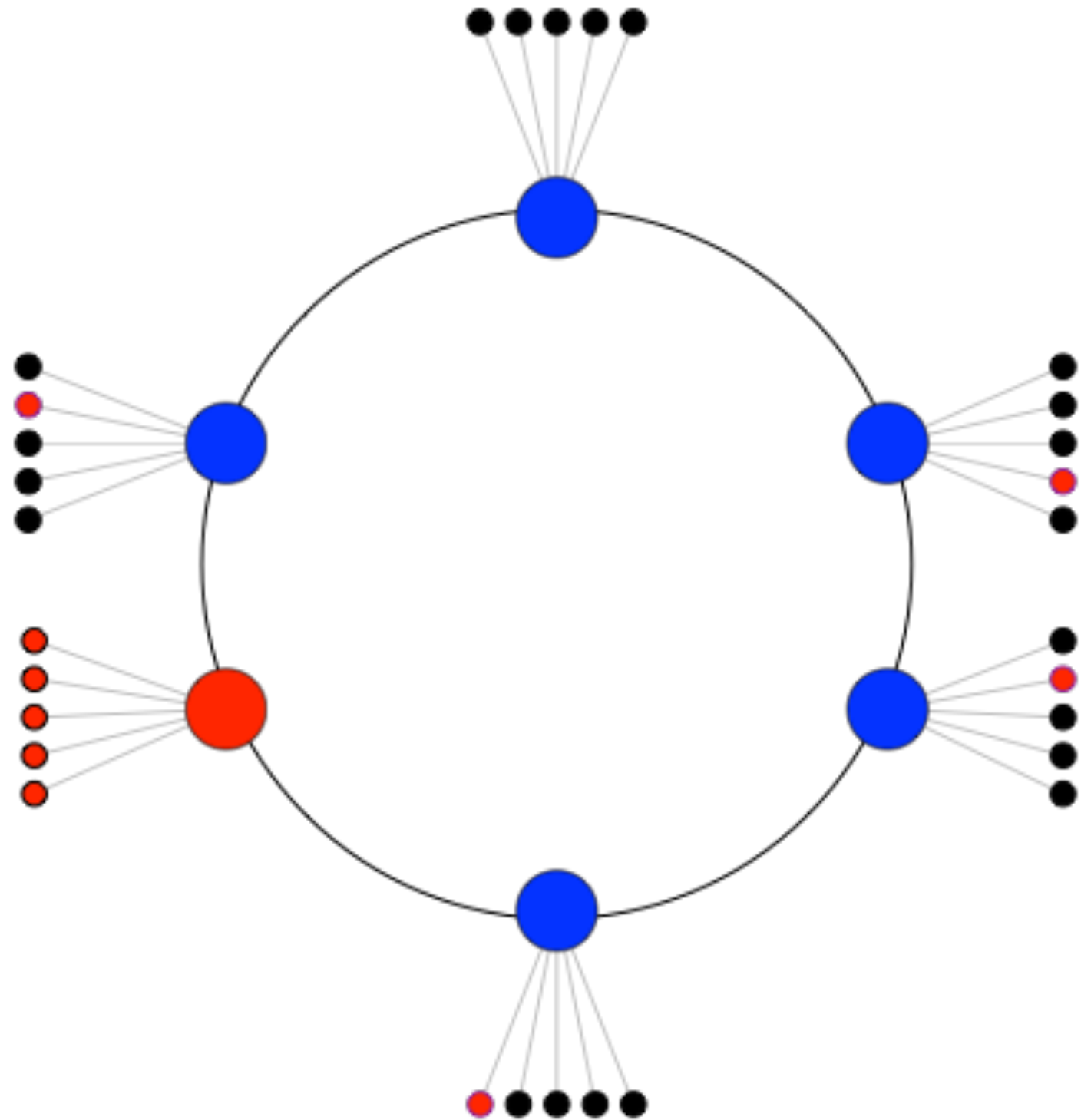


cc-by: Phil Wolff, SkypeJournal.com
Thanks to nyanya
Chart shows Japanese Dates/Times

Causes

(3) Windows clients (version 5.0.0152) can not process delayed messages and crash.

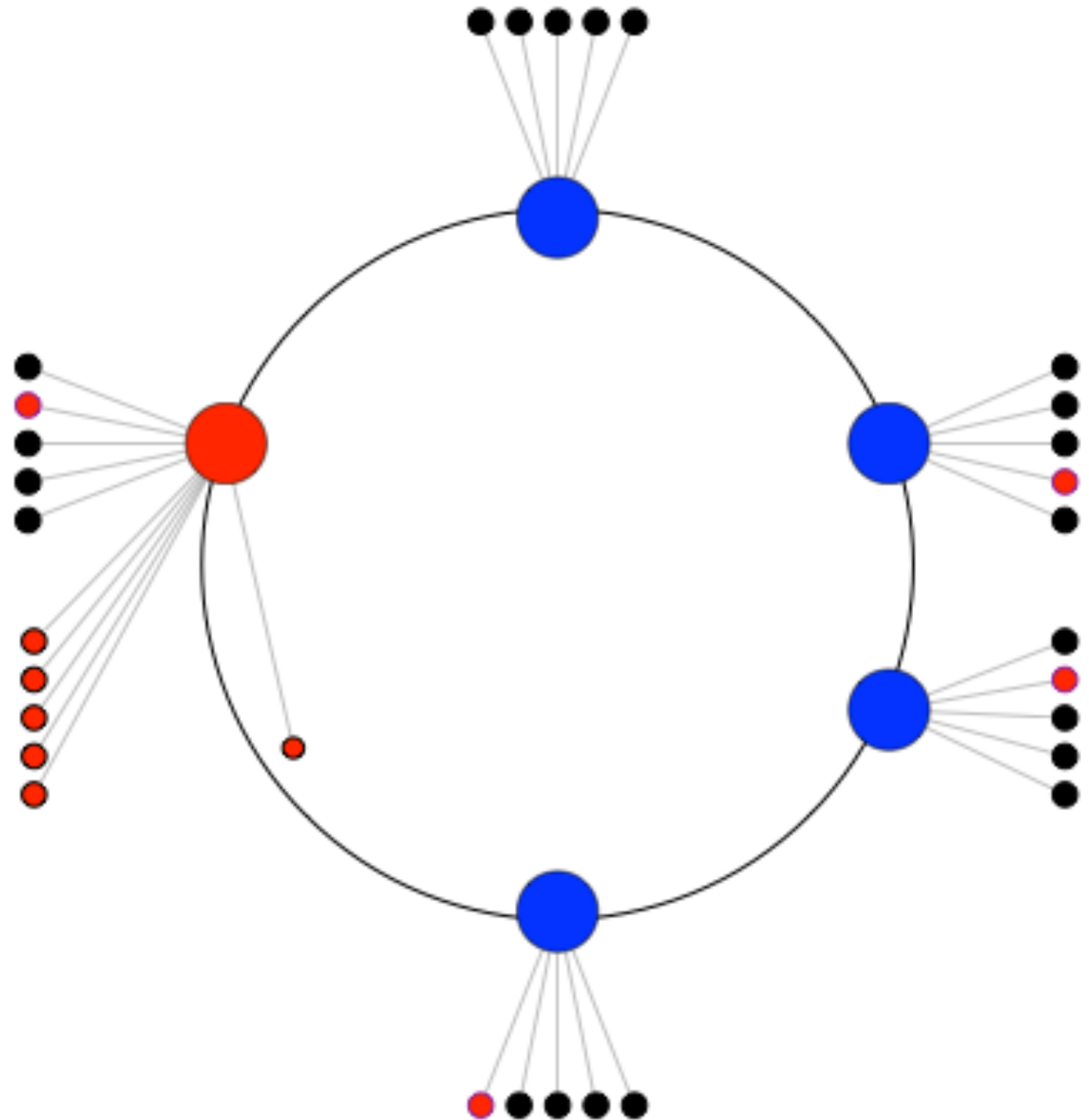
(4) This clients included 25-30% of the publicly available supernodes.



Causes

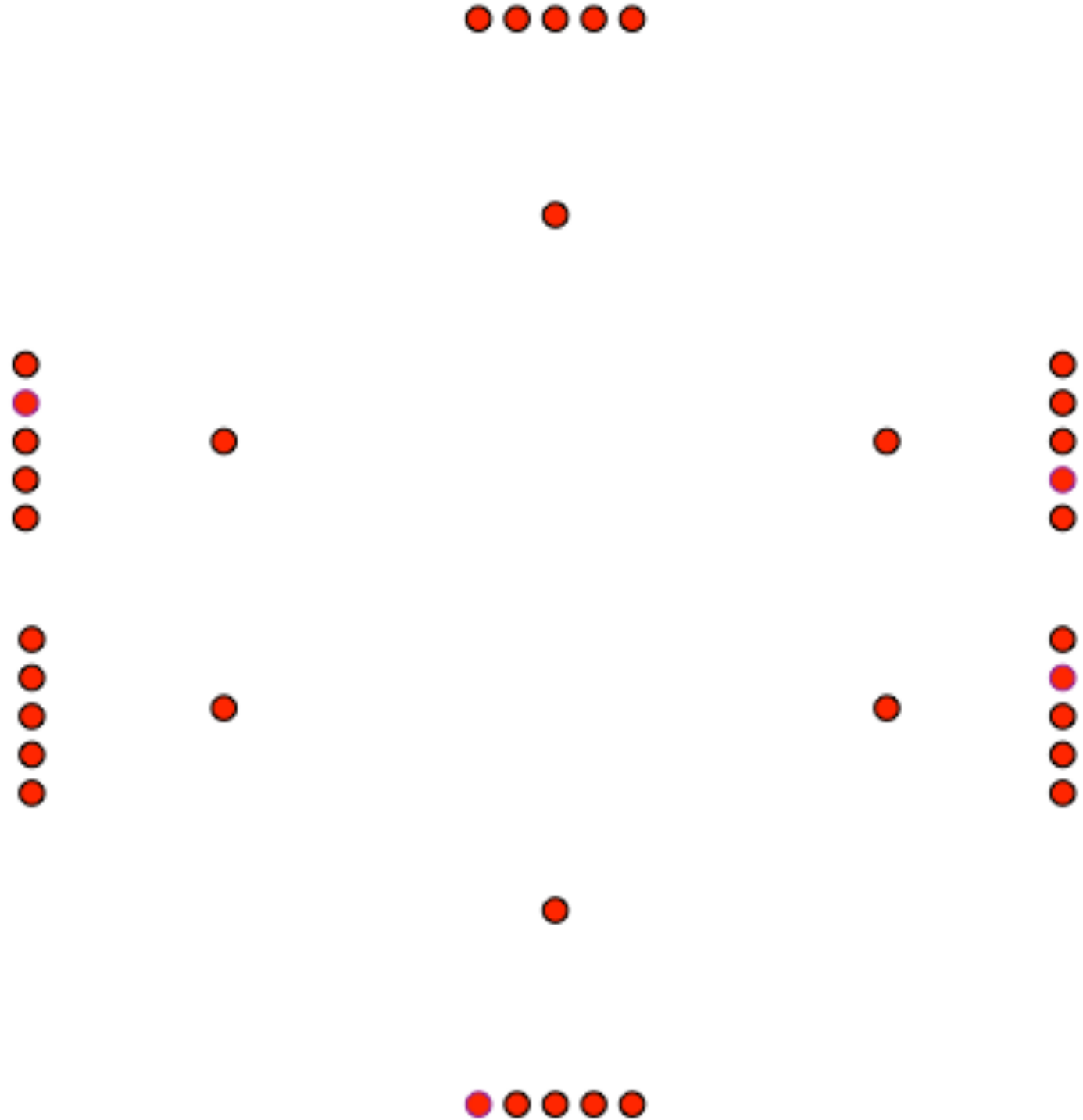
(5) Remaining supernodes receive a traffic 100 times bigger than the normal

(6) Supernodes have a built-in mechanism to avoid having a huge impact in the host system. This mechanism make more supernodes to shut down.



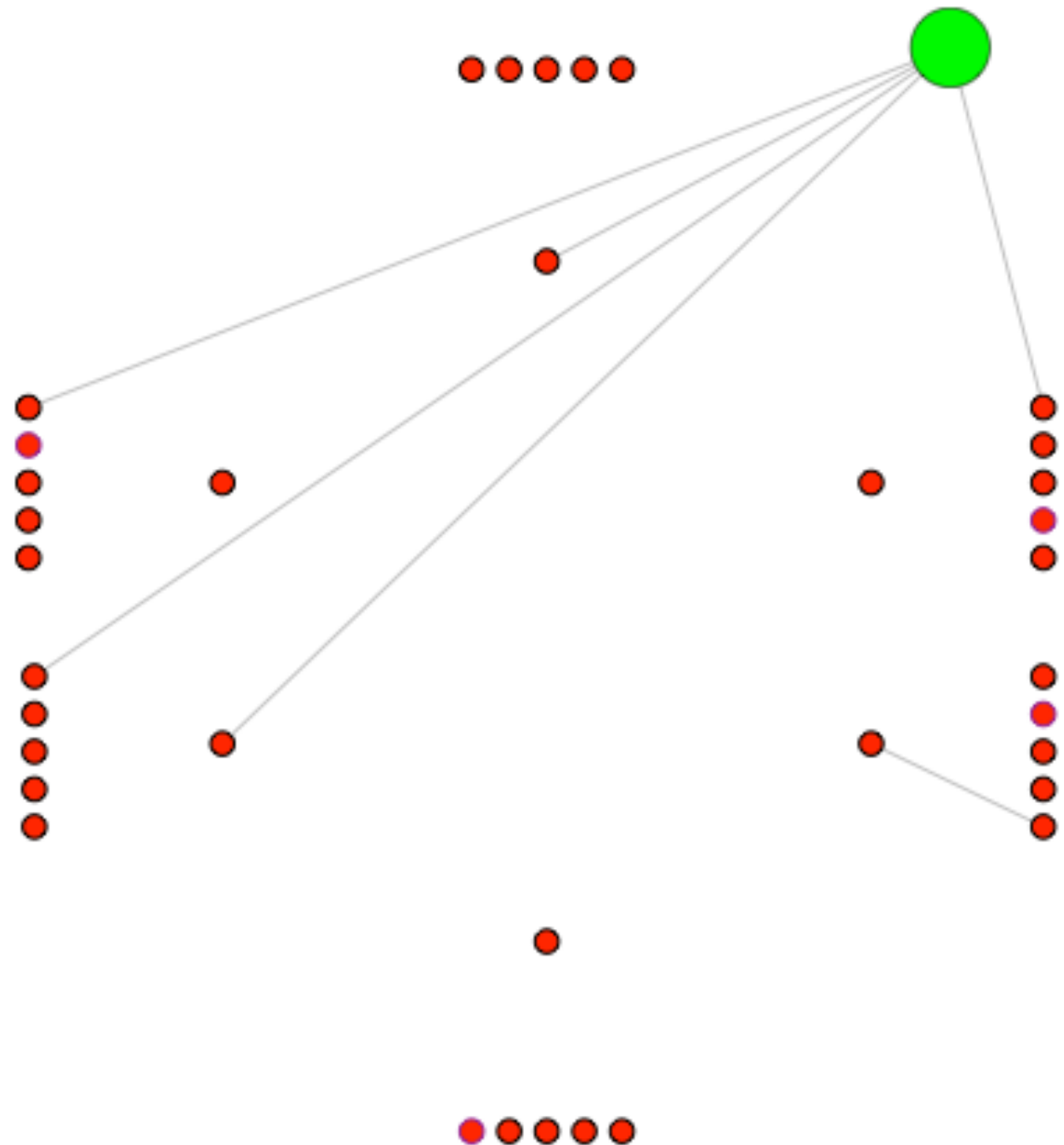
Causes

- The remaining supernodes failed subsequently.



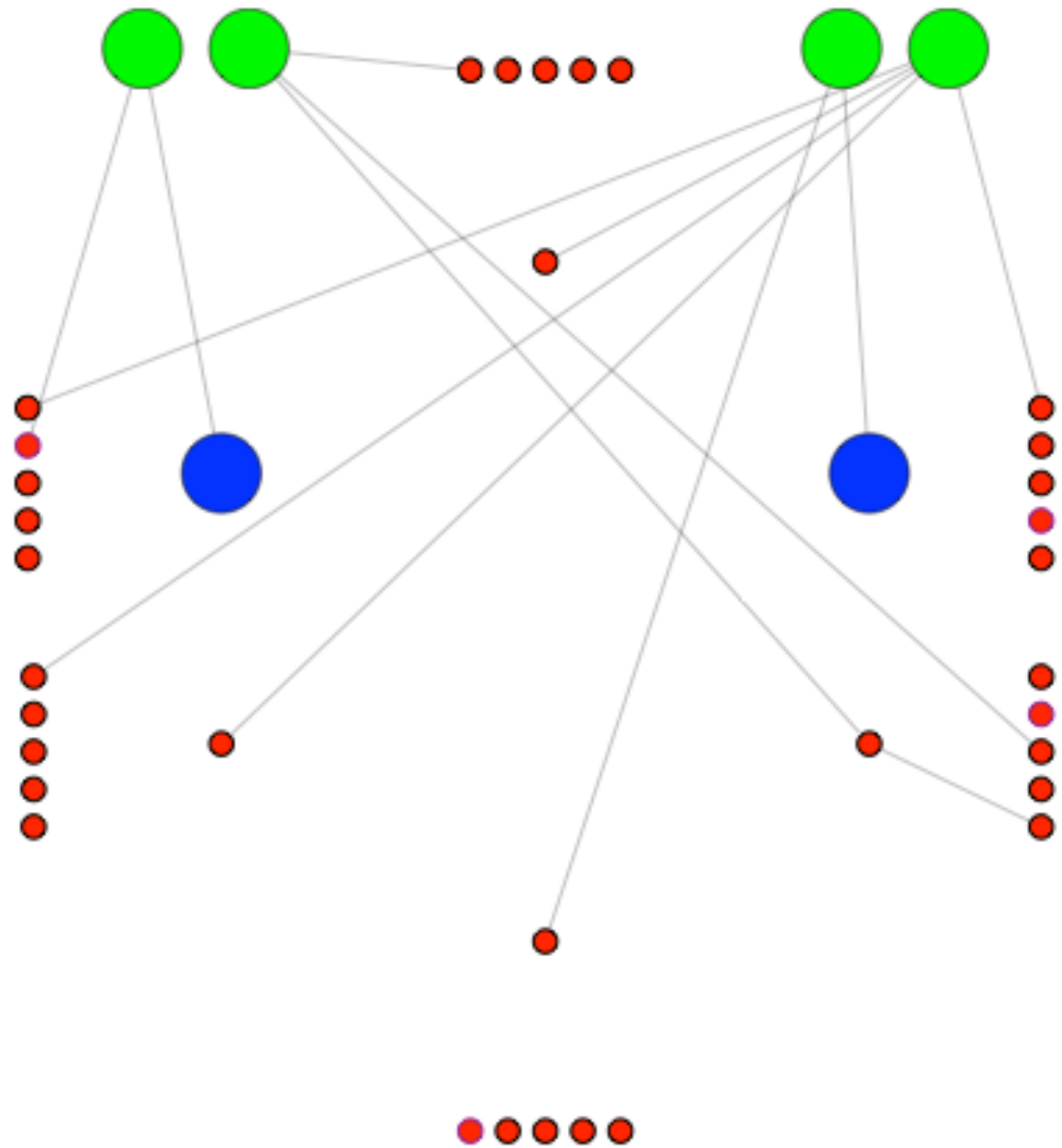
Recovery

- Engineering team added hundred of new «mega» supernodes.
- However, only a small portion of users (15-20%) were «healing».



Recovery

- The team introduced several thousands of supernodes, using the resources that support the Group Video Calling.



Conclusion

- «While our Windows v5 software release was subject to extensive internal testing and months of Beta testing with hundreds of thousands of users, we will be reviewing our testing processes to determine better ways of detecting and avoiding bugs which could affect the system.»
- The second «big» Skype outage, the first one dates back to 2007.

References

- «CIO update: Post-mortem on the Skype outage».
- Lars Rabbe, December 2010.
- http://blogs.skype.com/en/2010/12/cio_update.html
- «P2P Telephony Explained — For Geeks Only».
- <http://www.skype.com/intl/en/support/user-guides/p2pexplained/>

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