



Irving Fisher Committee on
Central Bank Statistics

BANK FOR INTERNATIONAL SETTLEMENTS

IFC – Bank Indonesia International Workshop and Seminar on “*Big Data for Central Bank Policies / Building Pathways for Policy Making with Big Data*”

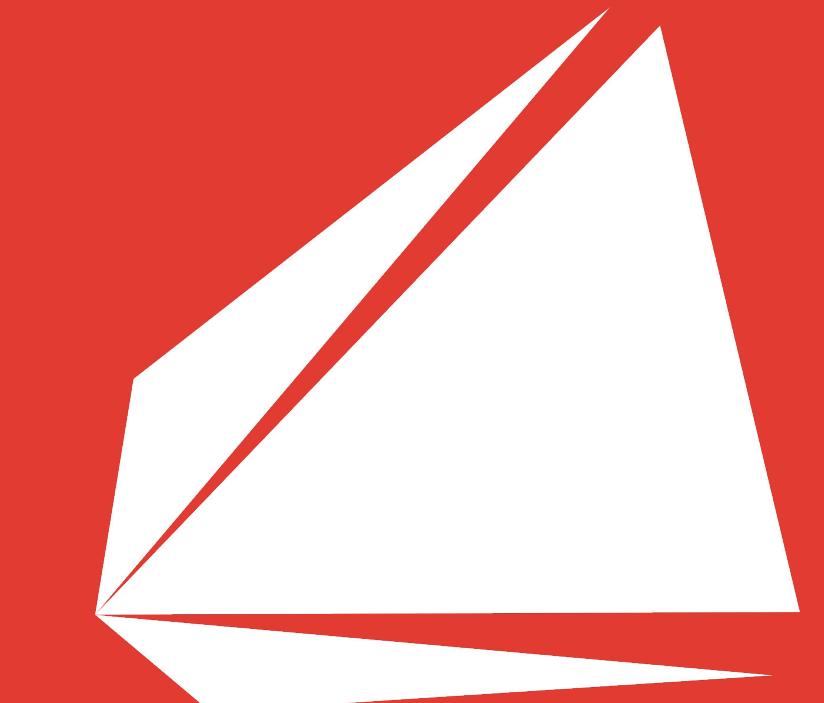
Bali, Indonesia, 23-26 July 2018

Exploiting big data for sharpening financial sector risk assessment¹

Kimmo Soramäki,

Financial Network Analytics

¹ This presentation was prepared for the meeting. The views expressed are those of the author and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the meeting.

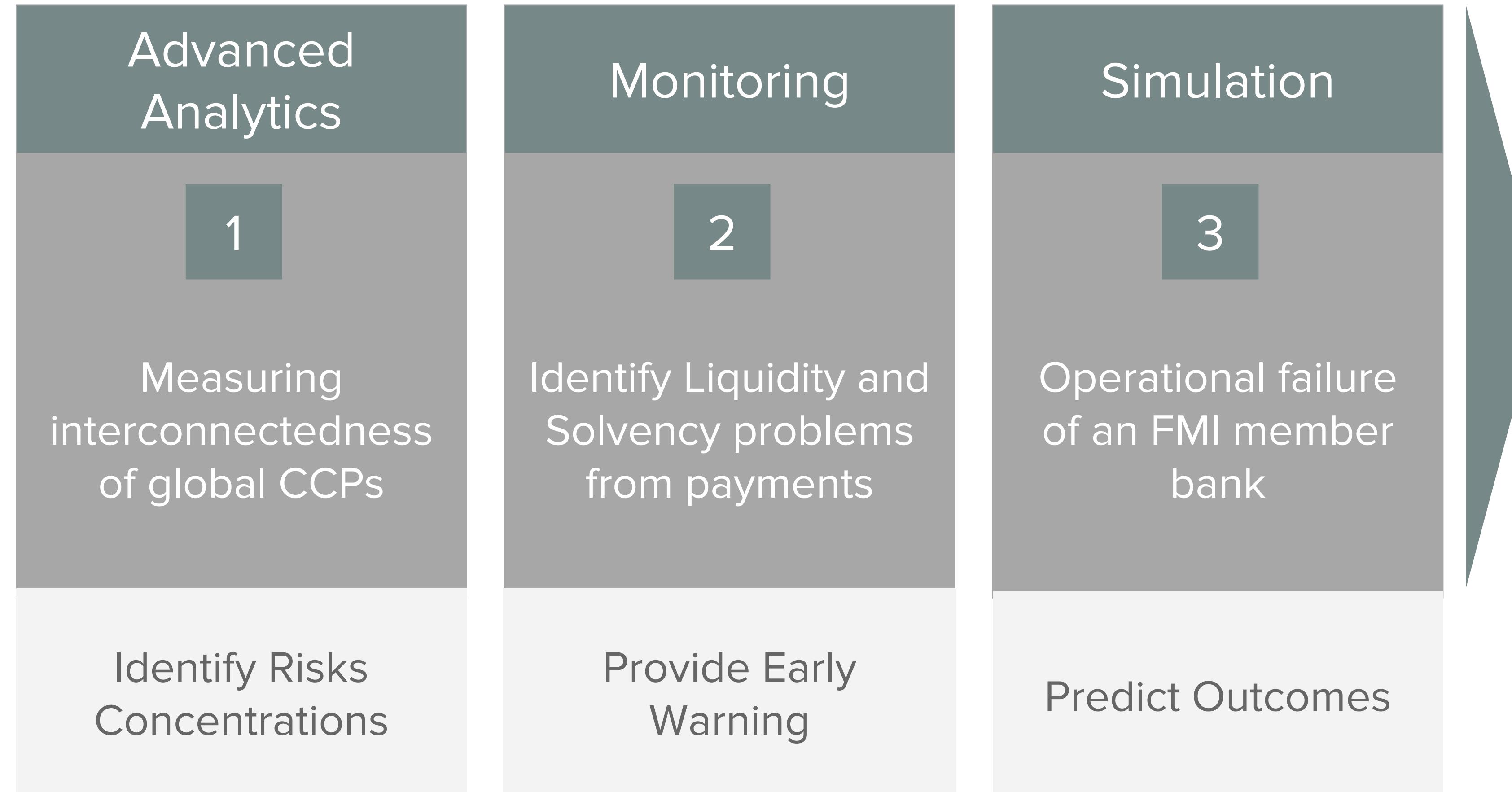


Exploiting Big Data for Sharpening Financial Sector Risk Assessment



Dr. Kimmo Soramäki
Founder & CEO, FNA

Agenda: Three Examples



Motivation

The **New Systemic Risk**

Three CCP failures in the past (Paris, Kuala Lumpur and Hong Kong)

Interest by regulators, CCPs and members.

Especially with tie in to Cyber, IT and other operational risks.

"They [CCPs] are not equipped, however, to test the impact of their failure on the financial system as a whole nor are they equipped to assess the potential contagion effect on other members of a given member's failure."

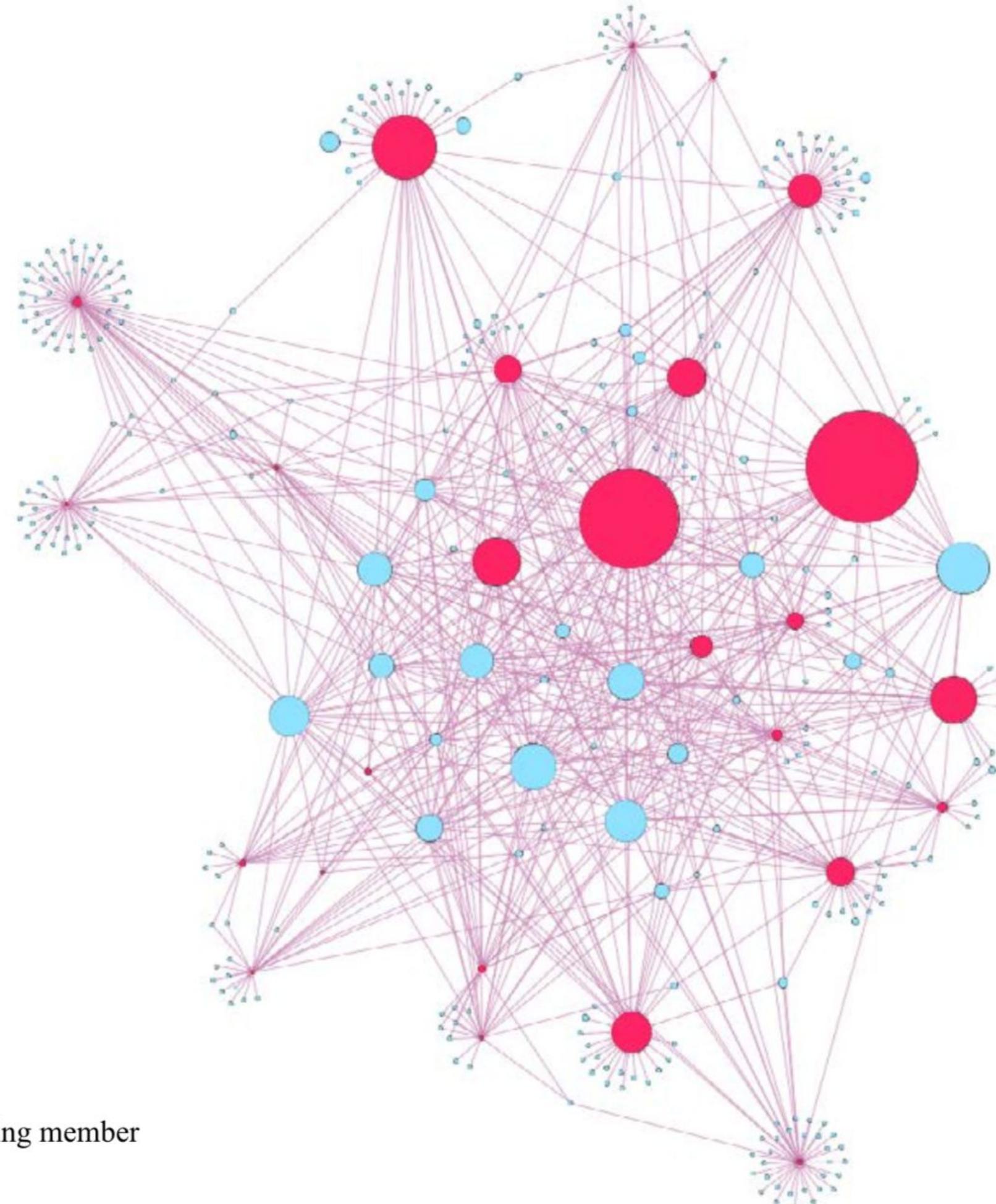
Cox & Steigerwald (2018)

Scope of Analysis

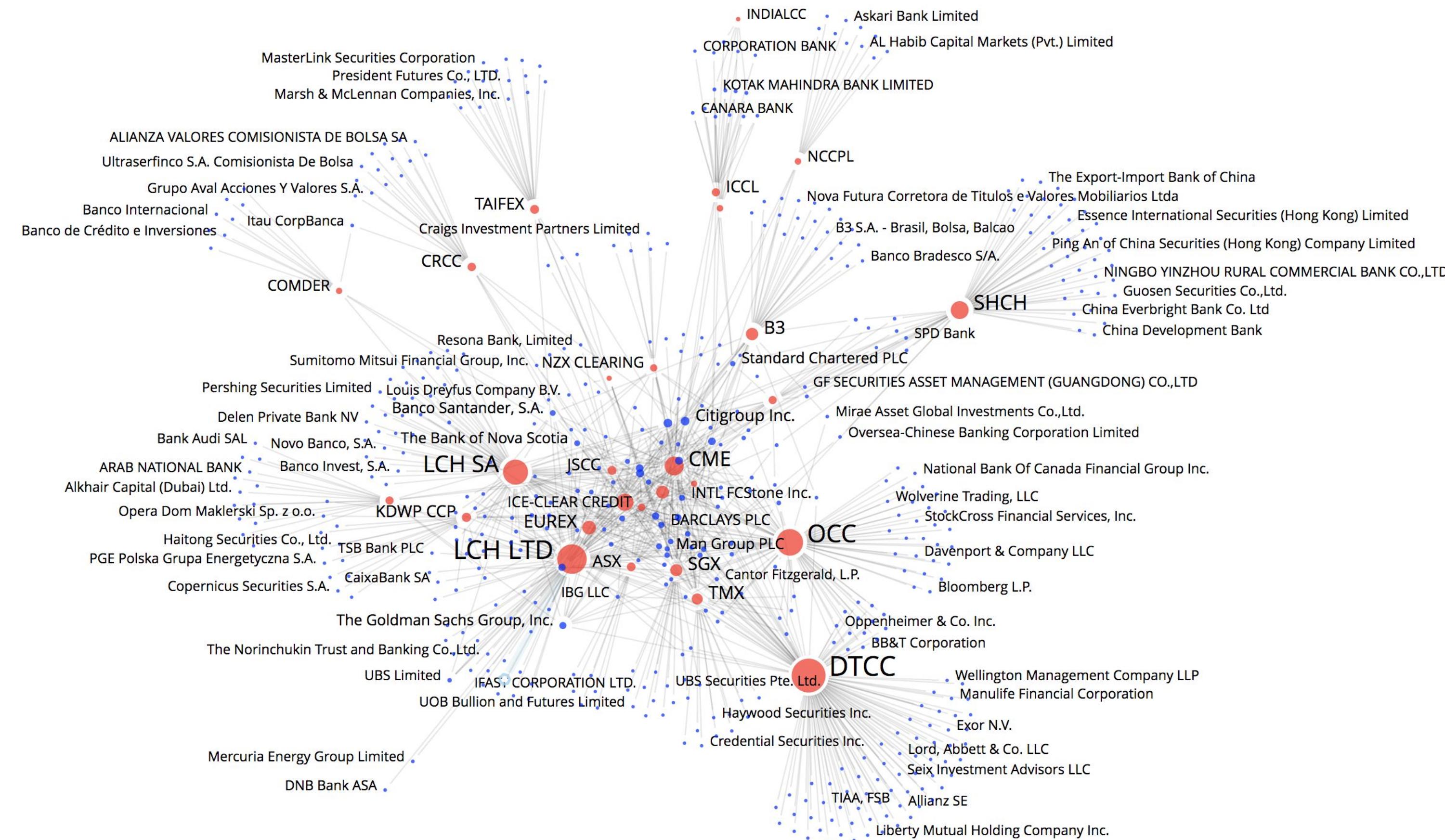
Comparison with BIS "Analysis of Central Clearing Interdependencies" (2017)

	BIS (2017)	FNA (2018)
CCPs	26	29
Jurisdictions	20	25
Clearing Members	n/a	811
Parents Organizations	307	563
Roles	5 (member, settlement, LOC, ...)	1 (member)

Private vs Public Data



BIS (2017)



FNA (2018)

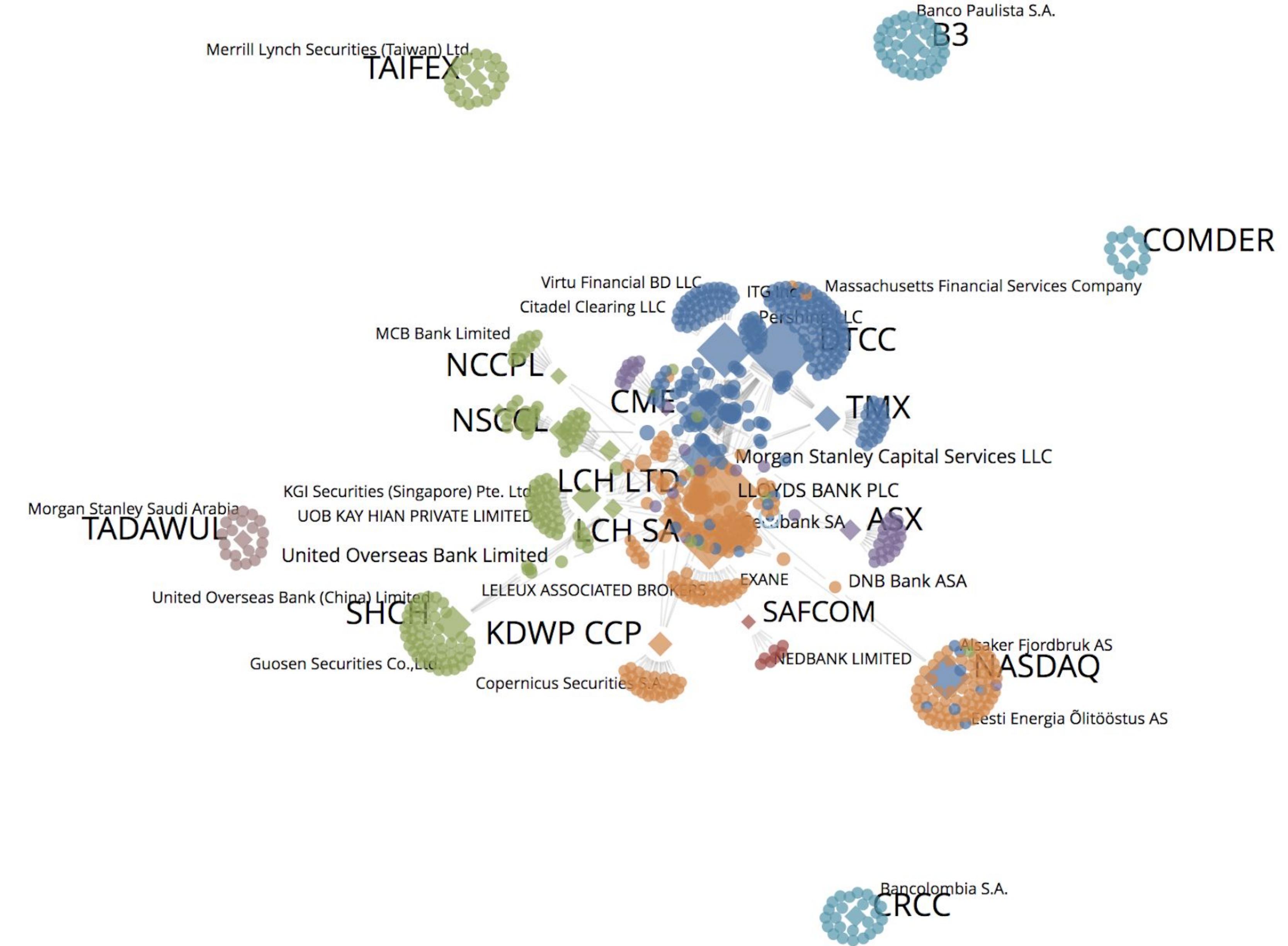
- CCP
- Clearing member

CCP Interconnectedness - Subsidiary Level

We see CCPs (diamonds) and their members (circles) from different regions:

- North America (blue)
- Europe (Yellow)
- Asia (green)
- Middle East (brown)
- Latin America (blue)
- Australia & Oceania (purple)

On subsidiary level, we see a tight core with peripheral CCPs and a number of completely disconnected CCPs from Latin America and Middle East.



Banking Groups

210 Banking Groups

Largest (# of entities):

1. Citigroup (19)
2. Morgan Stanley (13)
3. Goldman Sachs (12)
4. JPMorgan Chase (12)
5. Bank of America (12)
6. HSBC (11)
7. Credit Suisse (10)
8. Deutsche Bank (10)
9. Nomura (9)
10. Banco Santander (8)

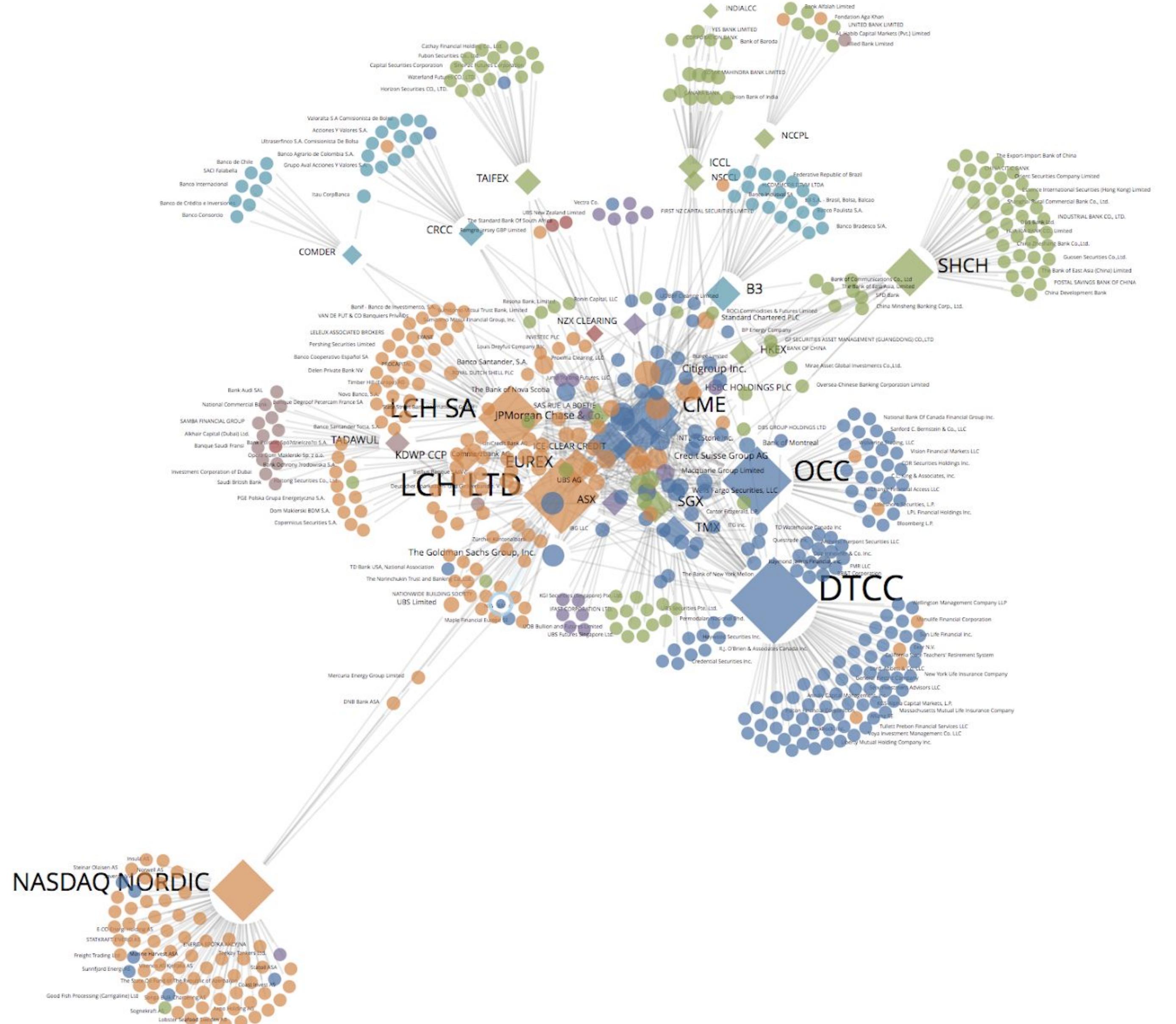


CCP Interconnectedness on Parent Level

We see CCPs (diamonds) and their members (circles) from different regions:

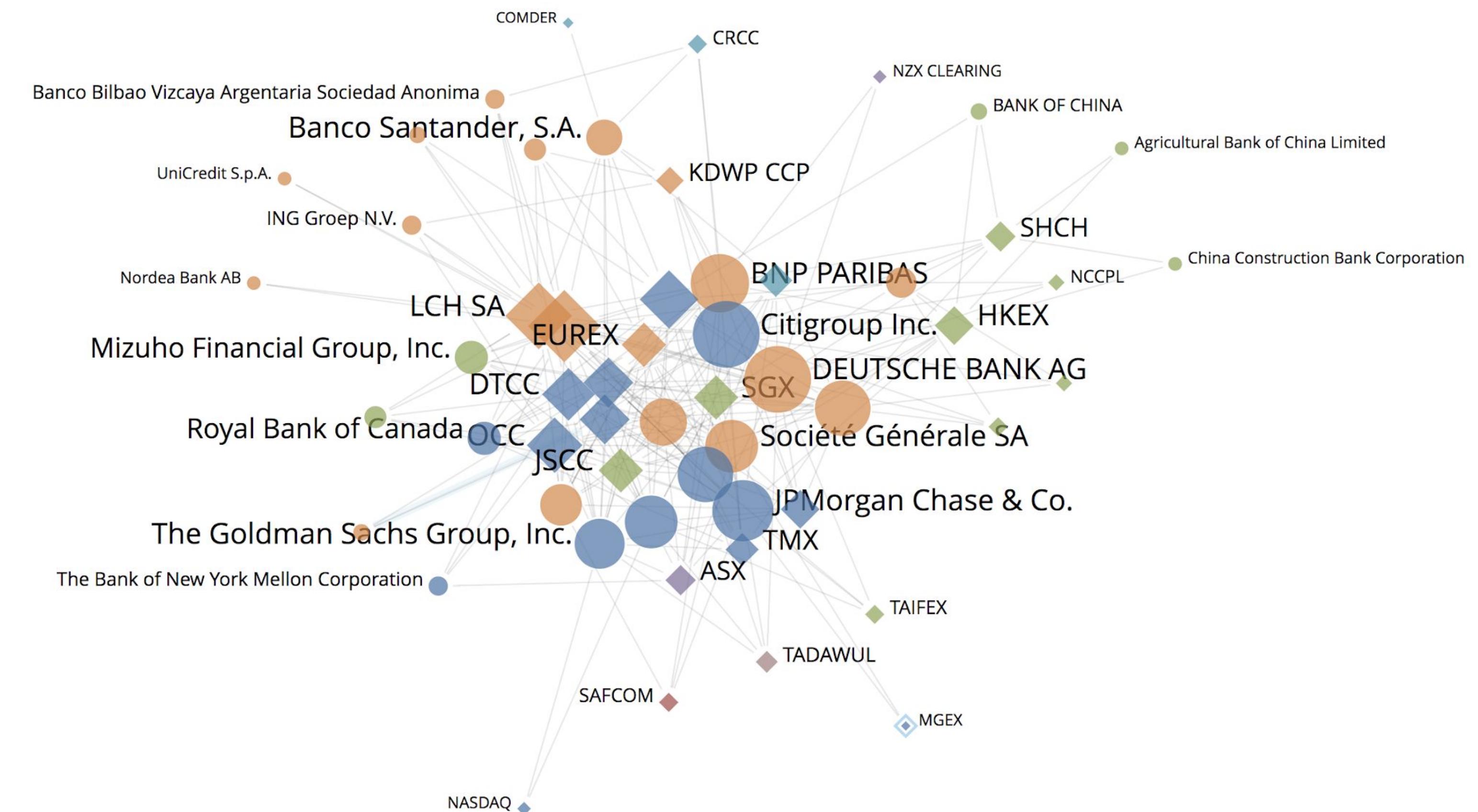
- North America (blue)
- Europe (Yellow)
- Asia (green)
- Middle East (brown)
- Latin America (blue)
- Australia & Oceania (purple)

On parent level we see a completely connected network dominated by a core consisting of CCPs from North America and Europe and global banks.



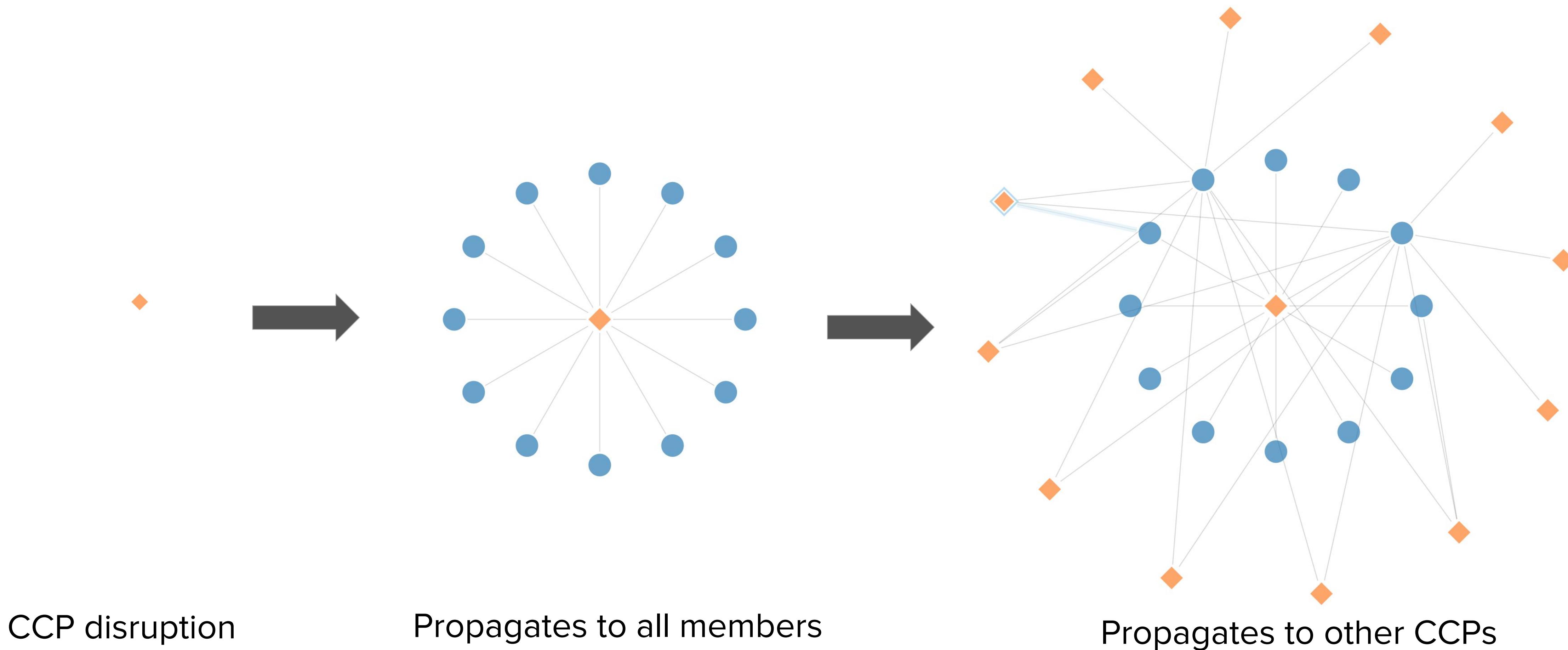
CCP Interconnectedness on GSIB Level

Bank (Parent)	# of FМИ
Citigroup	21
DEUTSCHE BANK	21
JPMorgan Chase & Co.	19
BNP PARIBAS	18
Bank of America	17
HSBC	17
Morgan Stanley	16
Societe Generale	16
The Goldman Sachs	15
Credit Suisse	14



Contagion - CCP Disruption

A disruption in a CCP would affect all of that CCP's clearing members, thereby affecting the other CCP's to which the affected CCP's members belong, possibly creating a cascading cycle as disruption is propagated across members and CCPs

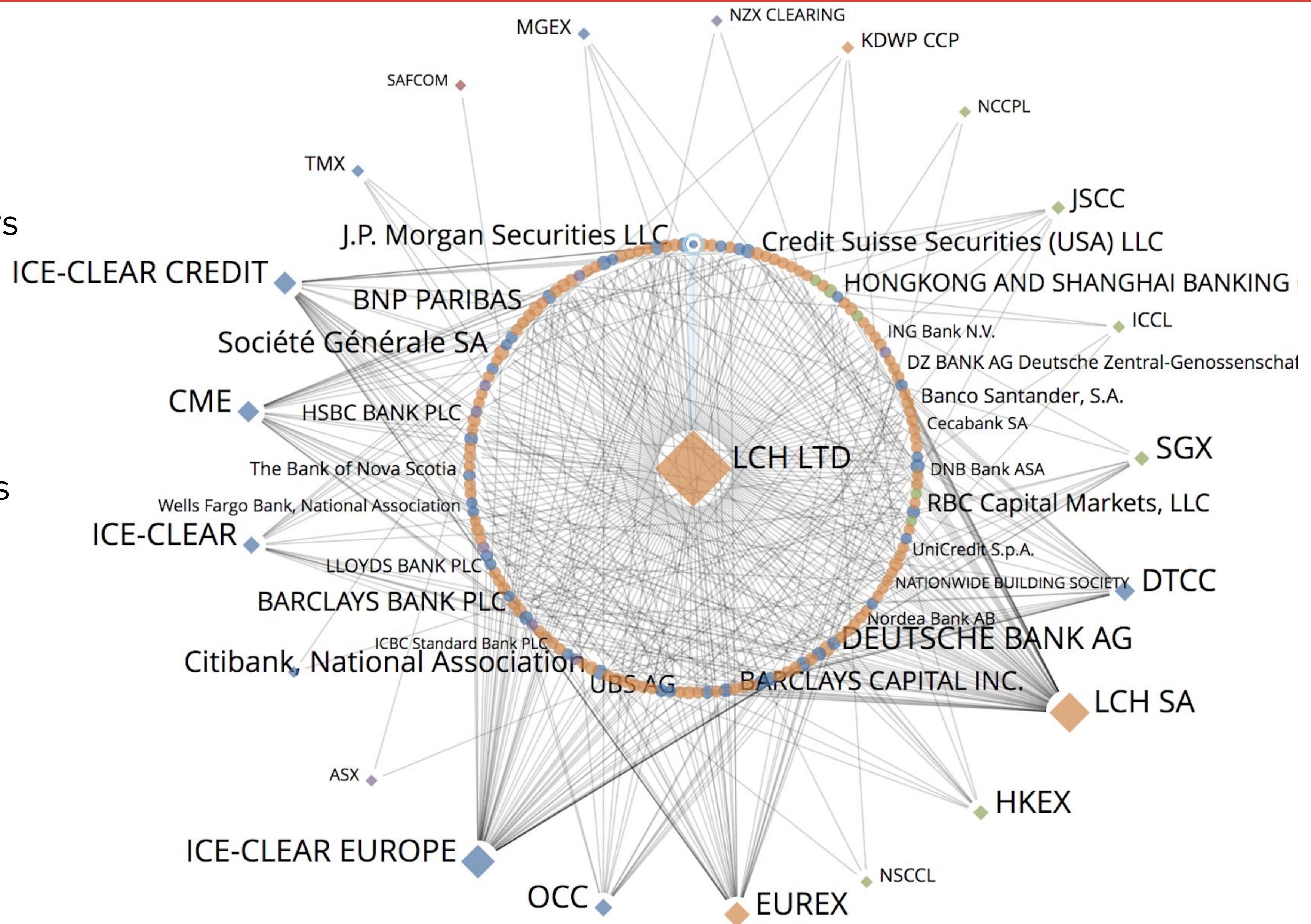


Footprint of CCPs - LCH Ltd

LCH Ltd 100 members are connected to 27 other CCPs

The membership is mostly European with a significant US base.

The most connected CCP is LCH SA and ICE-CLEAR EUROPE.



Contagion – Member Disruption

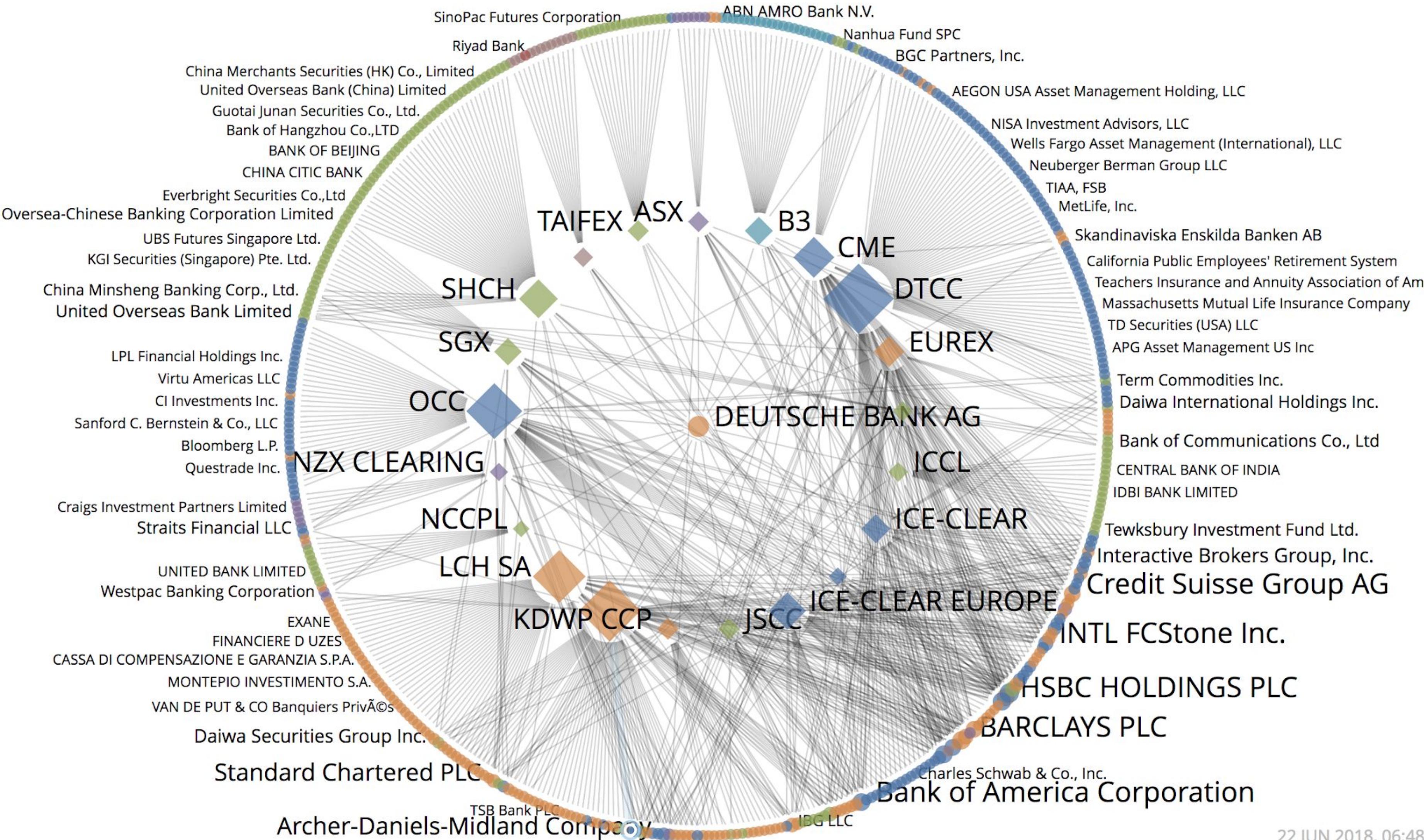
A member disruption can be felt by up to **458** banking groups or banks (of total of 563, or 80%) that are members of the same CCP as the stricken group.

Banking Group	# banking groups connected via a CCP
Deutsche Bank	458
Citigroup	446
Morgan Stanley	442
BNP Paribas	423
Goldman Sachs	412
HSBC Holdings	402
JPMorgan Chase	388
Bank of America	382
Credit Suisse	348
Société Générale	340

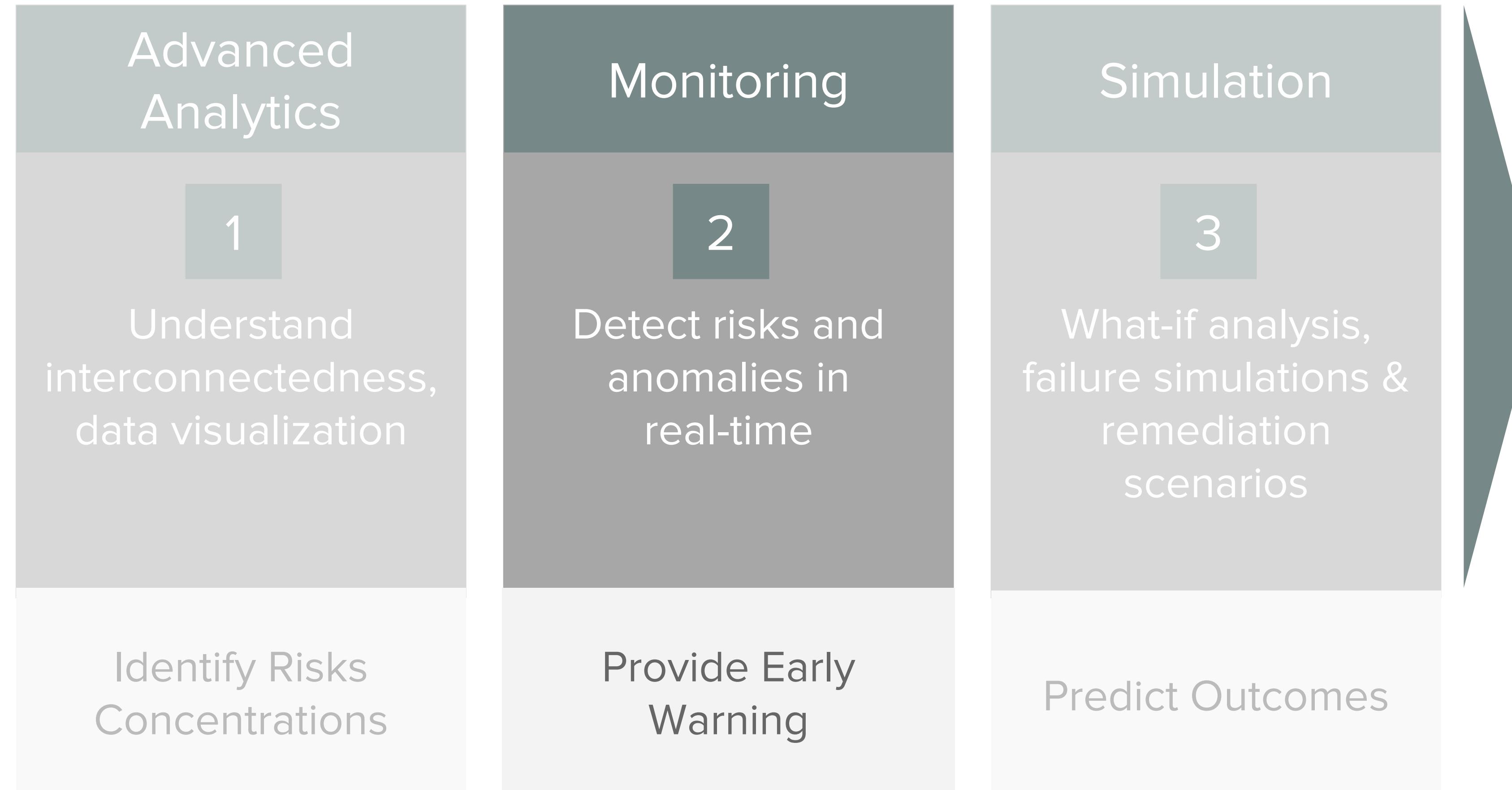
Contagion – Member Disruption

Deutsche Bank Group participates in 21 CCPs (of 29 mapped).

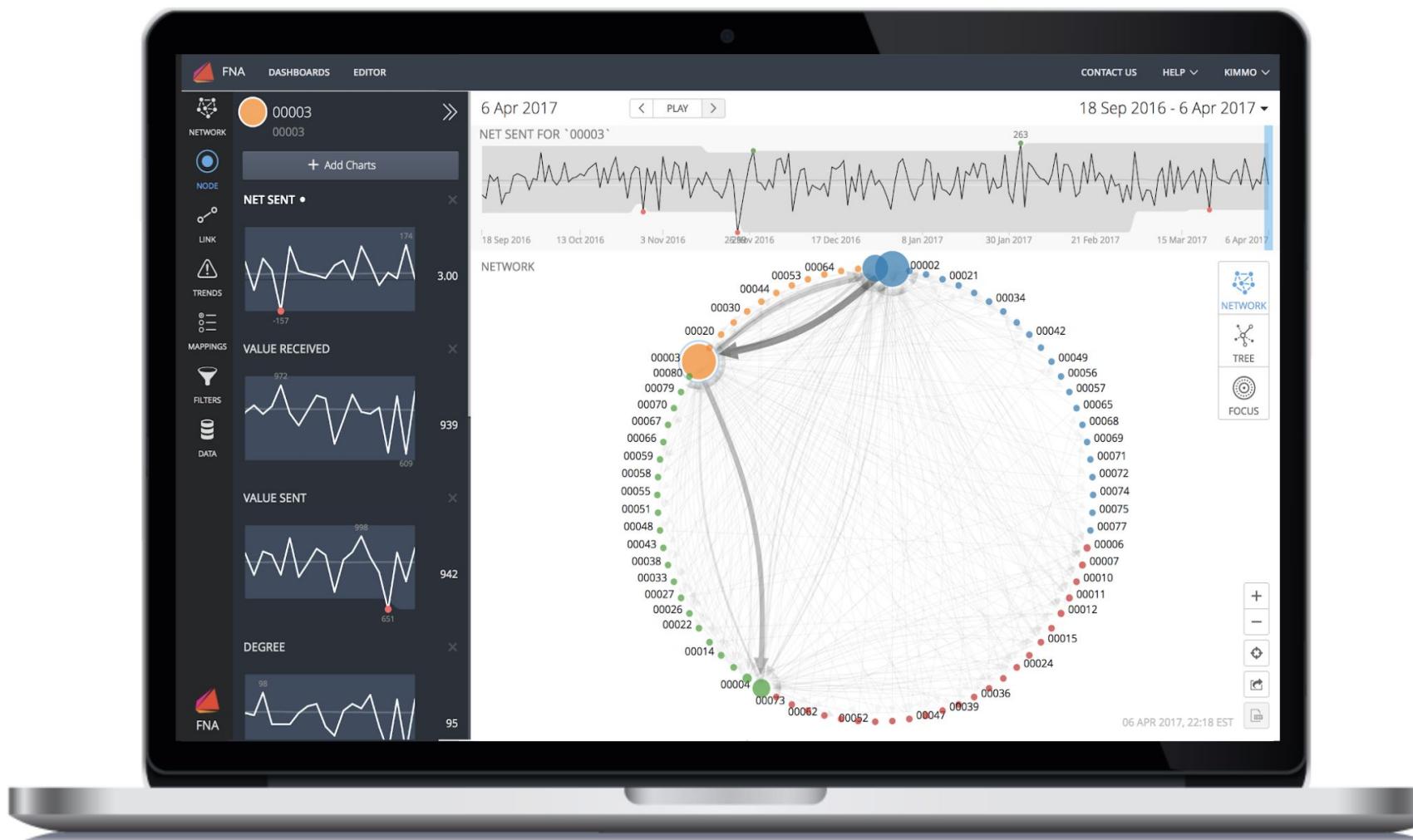
458 other banking groups or banks are members of these CCPs.



Journey



Use Case: Monitoring Liquidity and Solvency of FIs



Central Bank of Colombia identifies early warning on liquidity and solvency of financial institutions with FNA

Background

The Central Bank of Colombia has been using balance sheet and regulatory reporting data to understand the liquidity and solvency of participants in the Colombian financial system. However, the analysis is time consuming and the data comes months late.

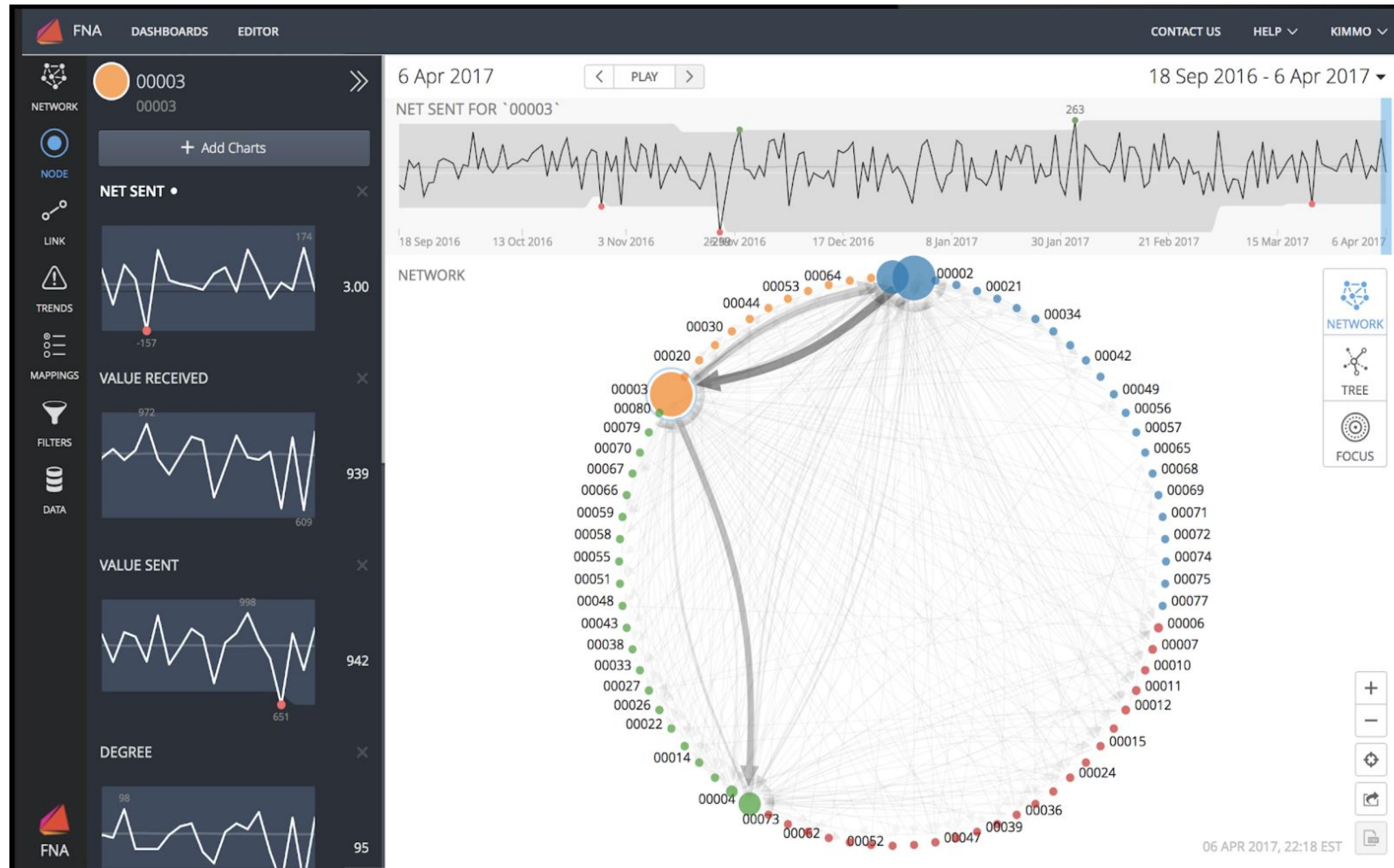
Objective

Using network analysis of data from the interbank payment system would allow the Bank to get early warning about risks substantially faster.

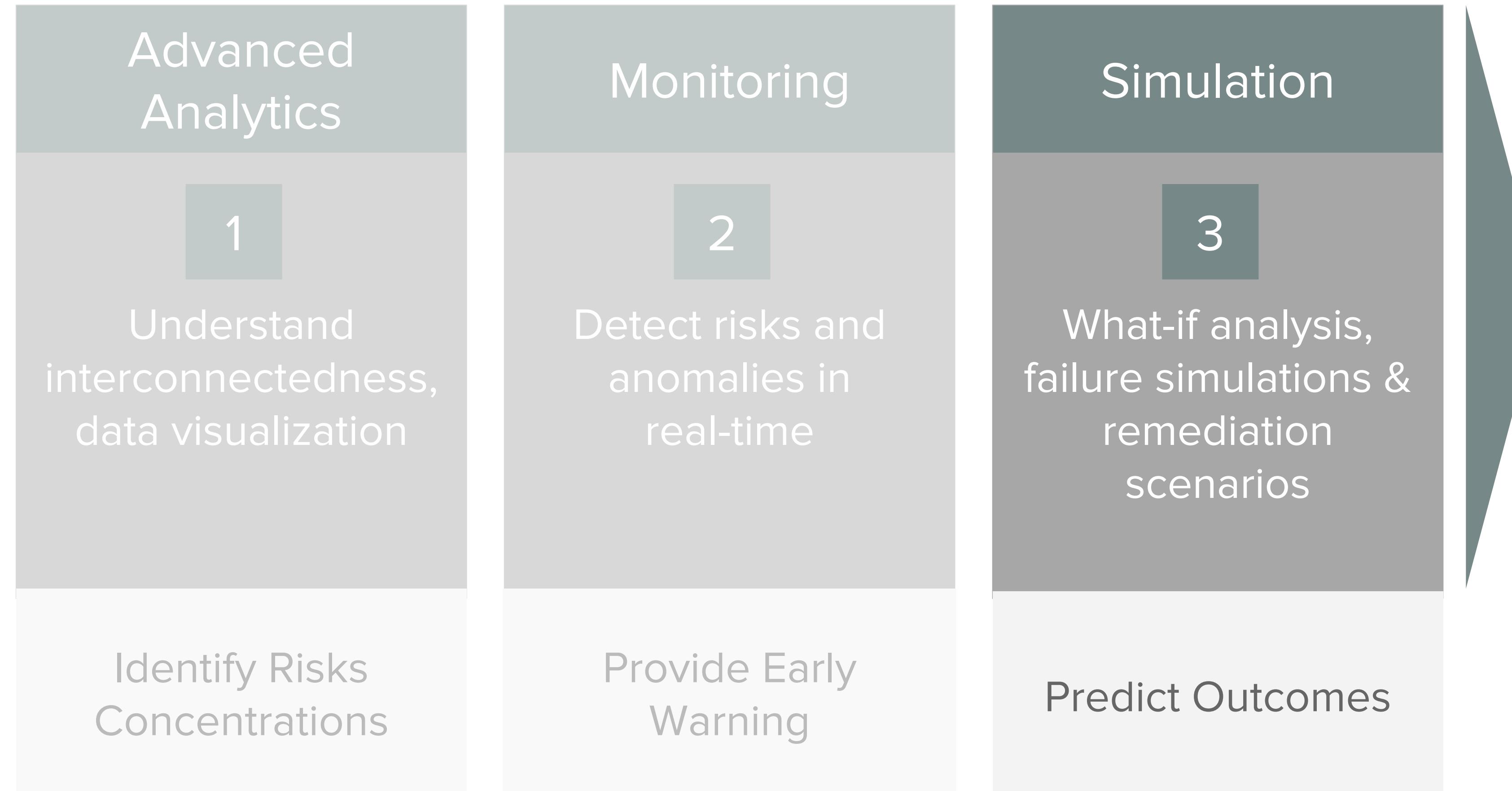
Outcomes

Using the FNA Platform, the Bank is now able to monitor its banking system in near real time. Automatic alerts notify the bank of any abnormal behavior in the network. Furthermore, automated stress tests where they fail the two largest participants in the network help to understand the riskiness of the system.

Use Case: Monitoring Liquidity and Solvency of FIs



Journey



Concept: Operational Failure of a Settlement Member

Mapping

This network shows settlement relationships

between the:

- CCP (center)
- Settlement members (inner circle) and
- Clearing members (outer circle)

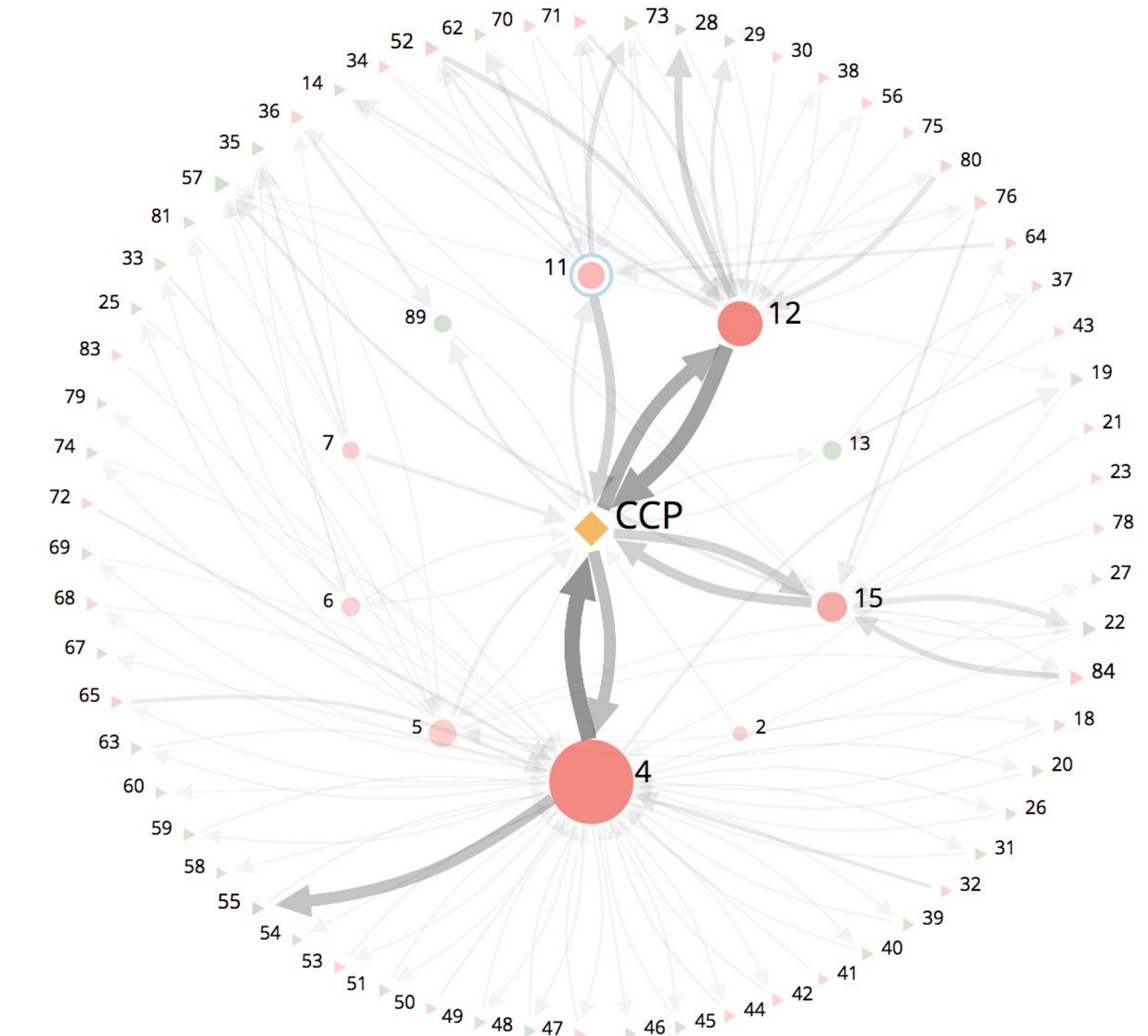
Note: Data is representative, not real

Size of node shows value of multilateral position

Width of lines shows value of bilateral positions

Question

What would happen if member 4 had an operational failure?



Backup Relationships

Map

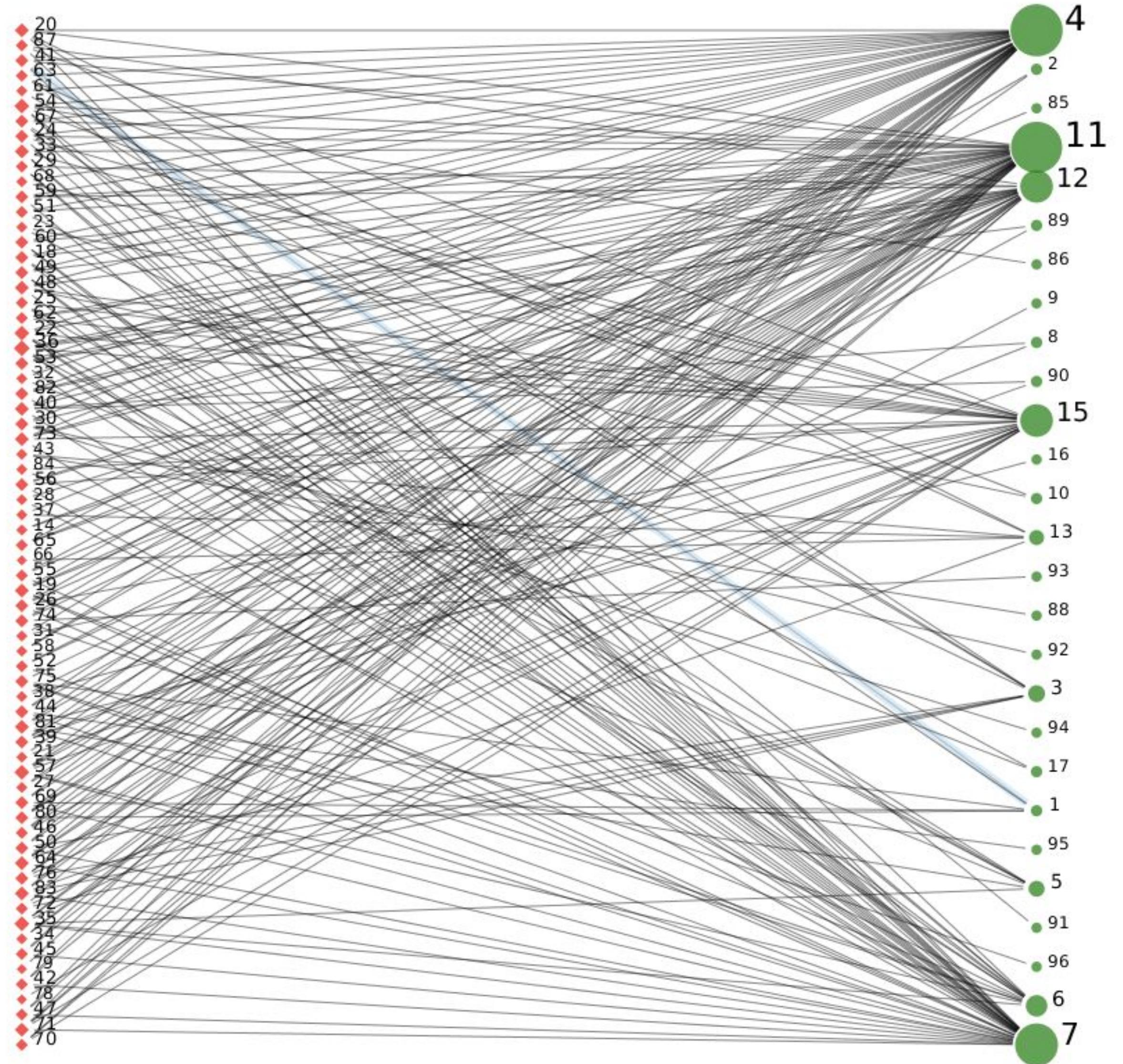
Shows Clearing Members on the left, and Settlement Members on the right.

The lines denote which settlement member the clearing member can use for settlement (ie its main and its backups)

Clearing Members

20
87
41
63
21
54
67
33
29
68
59
51
23
60
18
49
48
25
62
23
56
53
32
82
40
30
71
43
84
56
28
37
14
65
66
55
13
26
74
31
58
52
75
38
44
81
39
21
57
27
69
80
46
50
64
76
83
72
35
34
45
79
42
78
41
21
70

Settlement Members



Rewiring for Maximum Concentration

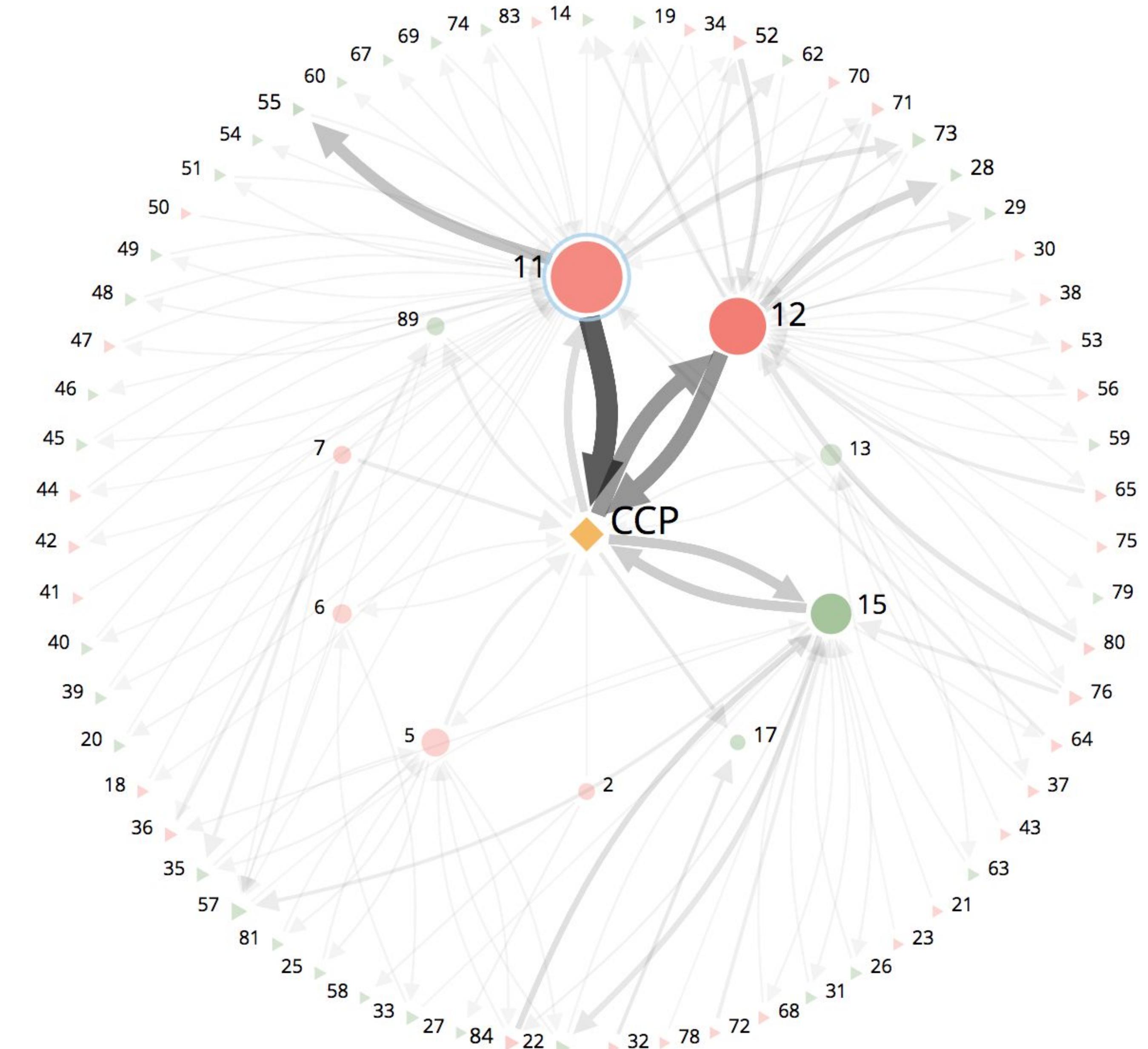
Each clearing member using Bank 4 must now effect settlement through one of its backup relationships.

Findings

Simulation shows that settlement flows could be concentrated on a few participants, e.g. causing operational challenges for Bank 11.

Insight

Bank 11 was not among the most active settlement members on a normal day, but might need to build operational capacity to cover for rare failure days.



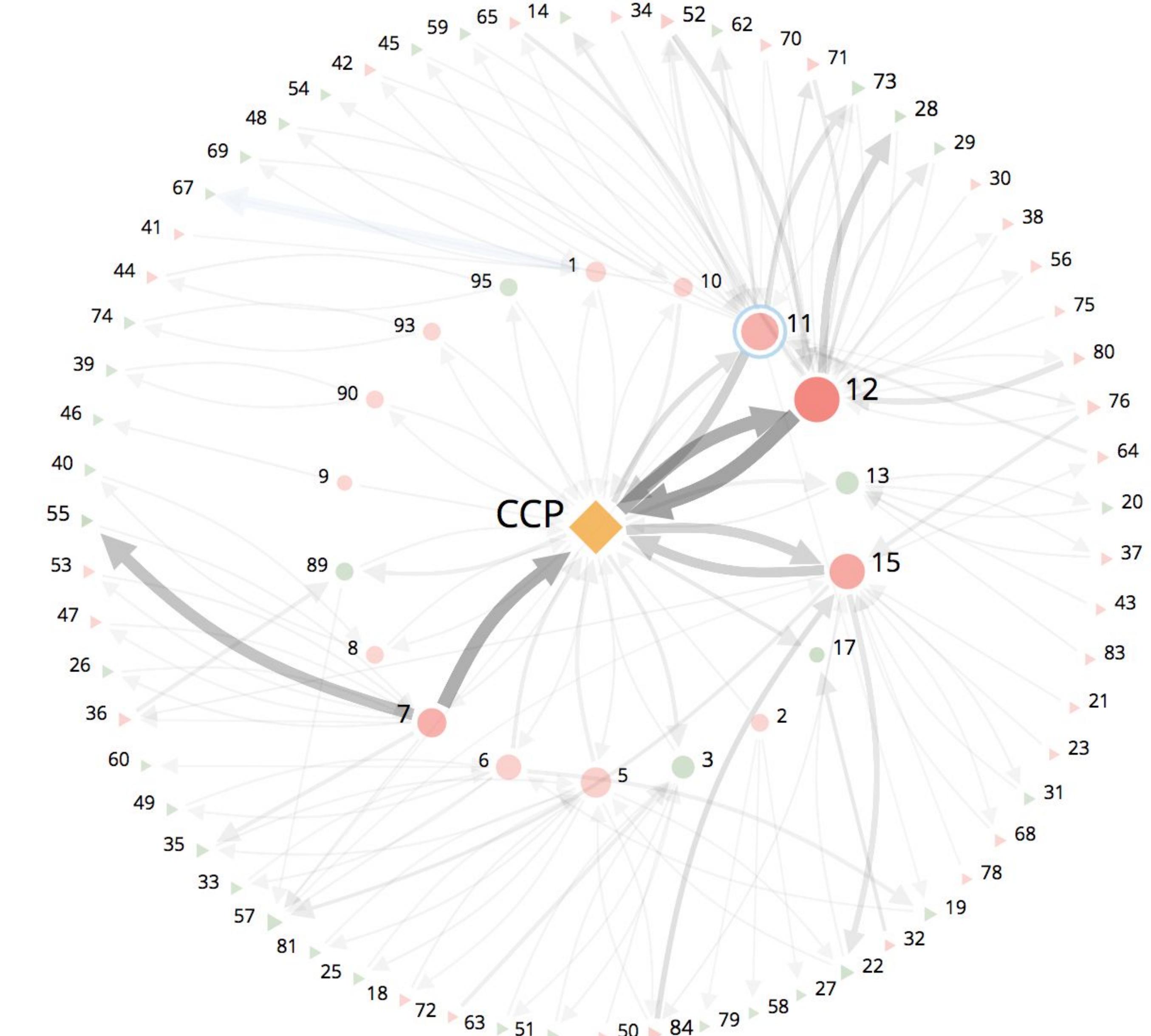
Rewiring for Minimum Concentration

Findings

... or clearing members might use different settlement members resulting in a much higher number (18 instead of 10) of settlement members for the day.

Insight

The CCP may need to build operational capacity to be able to complete settlement.



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