A New FAIR Method to Boost IT/OT Infrastructure Resilience

GOAL: Innovate the FAIR method for critical IT/OT network infrastructures. This innovation will lead to the design of resilient choices for IT/OT (process) networks that are subject to APT cyber-attacks.

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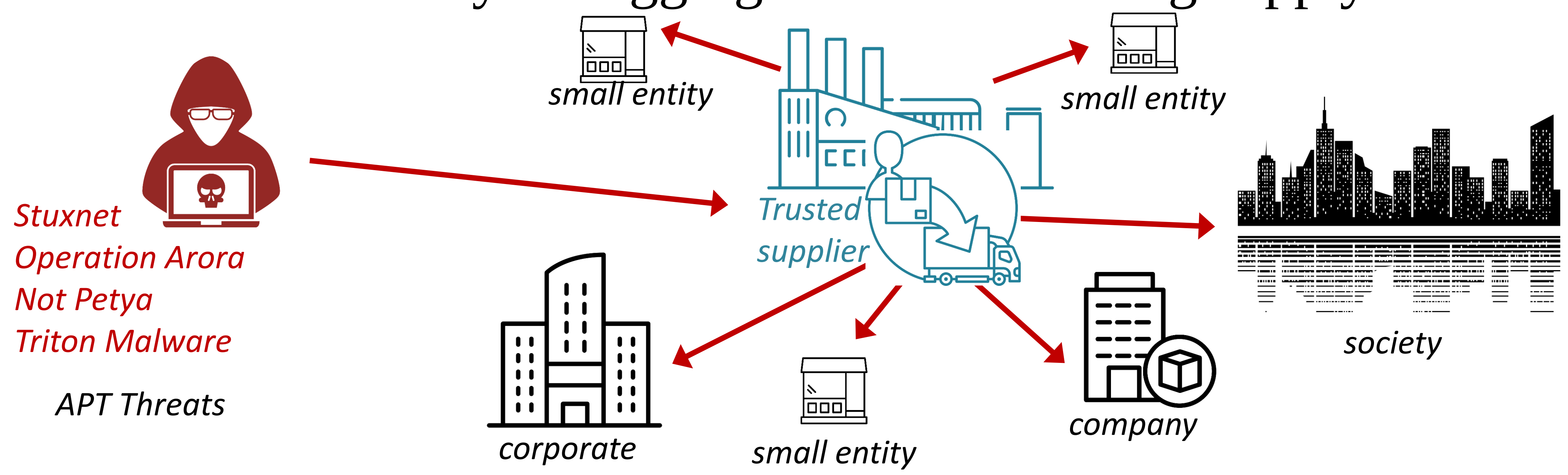
1. Interconnectedness aggregates cyber risk

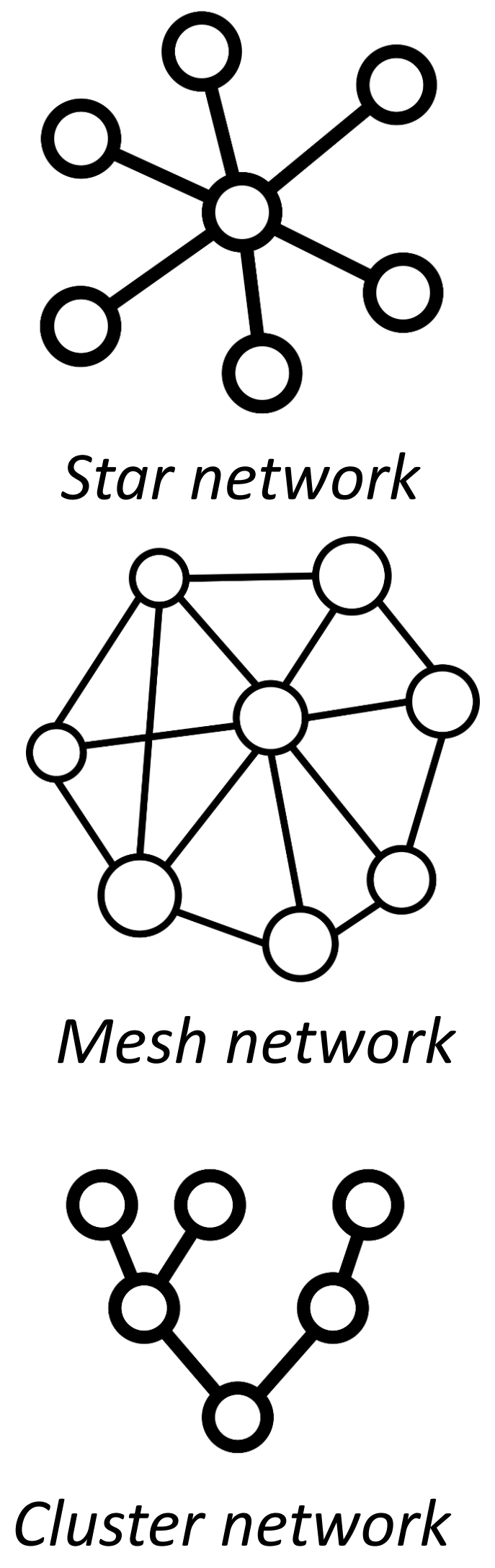
Security vulnerabilities in IT/OT networked business processes within critical infrastructures and enterprises increase their exposed risk to advanced persistent threats (APTs). This ultimately impacts business/society via aggregation effects along supply chains.



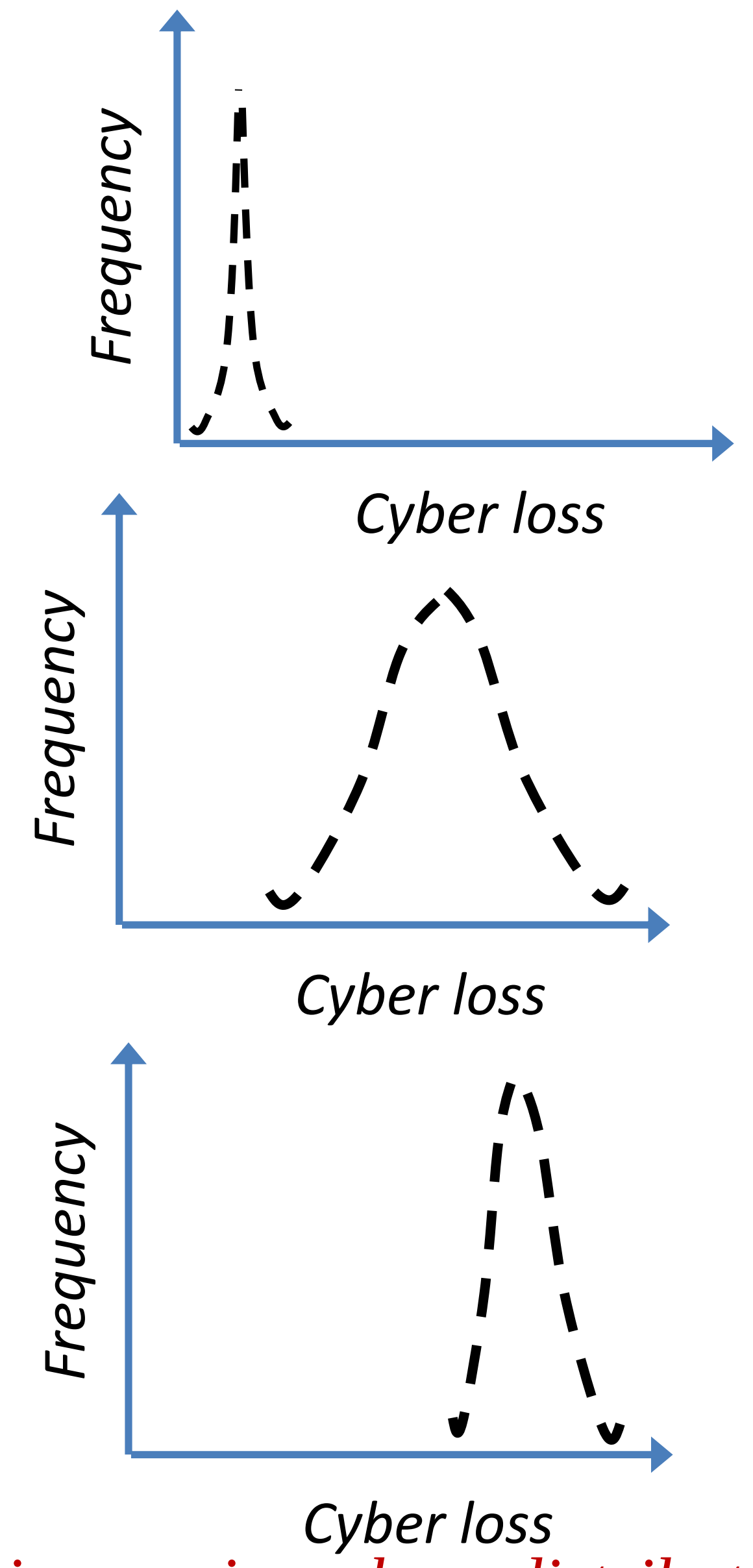
3. Finding: NW design influences loss impact

1. Enterprise susceptibility to security vulnerabilities within an adversary-aware IT/OT network influences *first-party* (FP) loss.
2. *Star* and *Mesh* IT/OT (process) networks reduce *first-party* loss.
3. Supply-chain network topologies (SCNT) of service-dependent enterprise ecosystems drive aggregate *multi-party* (MP) loss.
4. *Fat-tailed* node degree statistics in SCNTs drive MP CAT risks.

IT/OT Network architecture



First-Party Loss profile (topology)*



Plots are based on 100 K Monte-Carlo simulations using various loss distributions analyzed in our mathematical framework grounded in probability theory, random processes, network science, & statistics.

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2. Innovating FAIR for IT/OT system (process) networks

We innovate the FAIR method in TWO aspects: (a) estimate enterprise cyber-loss profile from APT threat impacts, and (b) estimate cyber-loss profile for enterprise IT/OT infrastructure (process) networks (NWs). Our innovation helps to:

- Assess *apriori*, enterprise cyber-loss impact profile (via a Monte Carlo method).
- Organize and design business processes NWs that limit APT cyber-loss impact.
- Drive (a) enterprise table-top exercises to execute APT risk scenarios in IT/OT NWs and (b) cyber-protecting NW *crown jewels* to mitigate cyber-loss impact.

4. Action items to boost resilience in IT/OT networks

(A) Network Architecture

Lower APT induced cyber-loss by:

1. Creating star shaped networks.
2. Creating business process elements in clusters.

(B) Resilience via Insurance

1. Cyber-insurance boosts IT/OT resilience.
2. Light tailed loss distributions will be sustainable to coverage in the cyber-insurance market.
3. Heavy tailed loss distributions will *not* be sustainable to coverage in the cyber- insurance market.
4. Improve cyber-posture and culture to attract cyber-insurance. providers.

(C) Network Security

Lower APT induced cyber-loss by:

1. Strong vulnerability management & patching discipline.
2. Deploying anomaly detection solutions.
3. Effective network segmentation.
4. Block and/or filter unwanted network traffic.

(D) Resilience Planning

Plan ahead to lower APT cyber-loss by:

1. Network penetration tests.
2. Bug bountry programs.
3. Cyber-range exercises.
4. Back-ups (data, code, state).

A tour of fat-tailed *(Cyber-Loss, Node Degree)* statistics

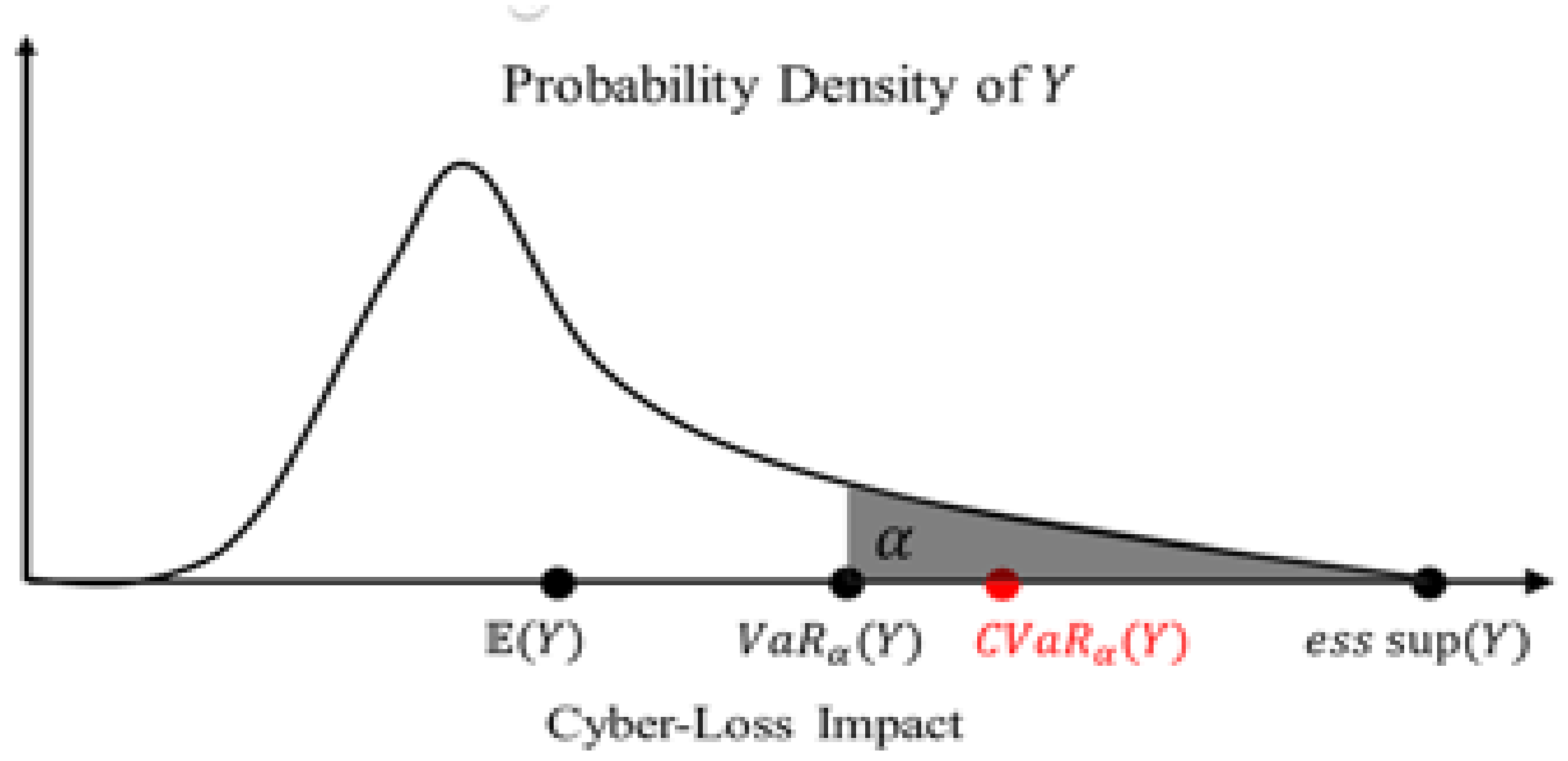

Illustration of fat-tailed cyber-loss impact. (α = fat tail degree)

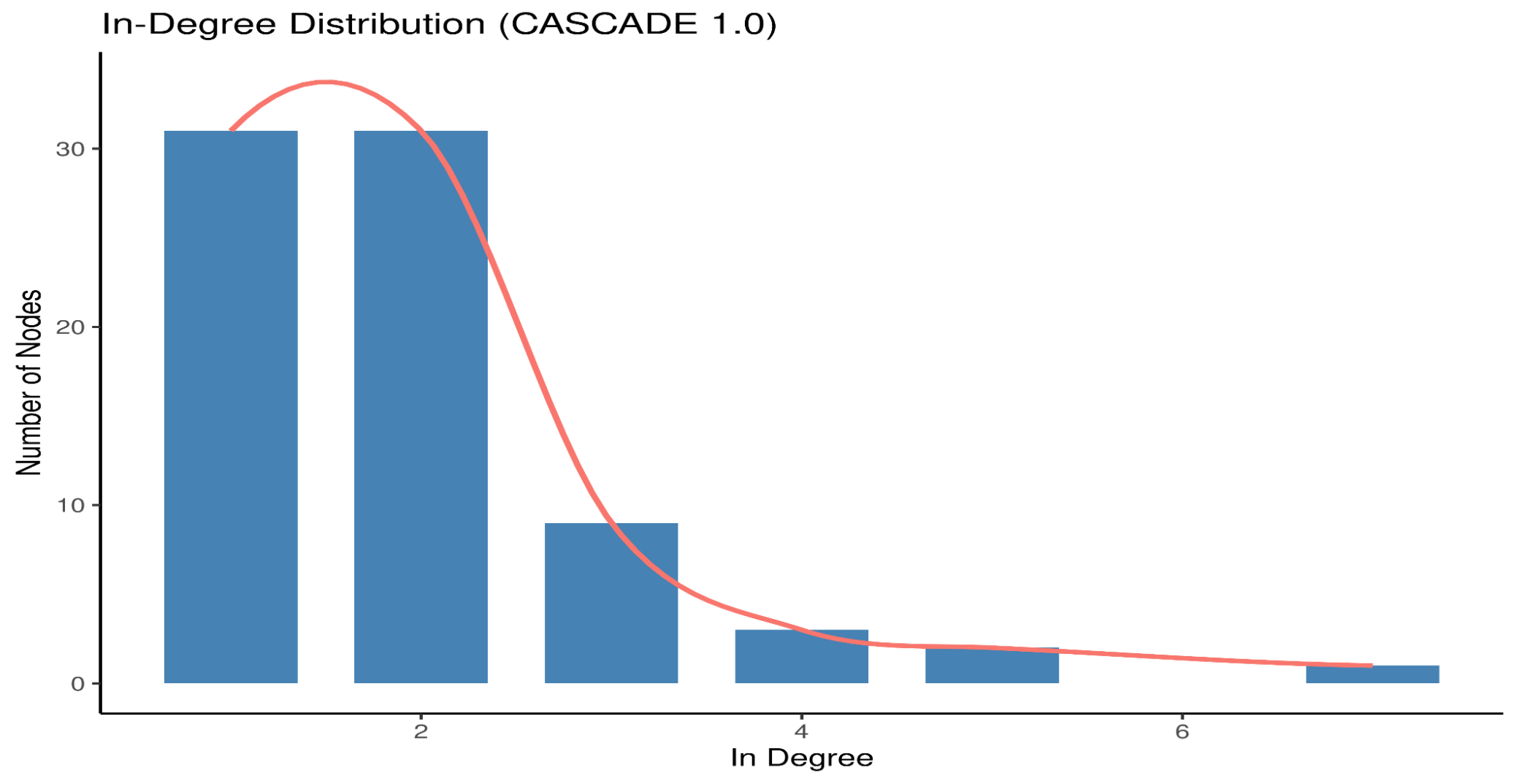

Illustration of fat-tailed node degree statistical distribution