Social Network

A social network is a social structure made up of a set of social actors (such as individuals or organizations), sets of dyadic ties (interaction between 2 people), and other social interactions between actors. A social network indicates the way the people and organizations are connected through various social familiarities, ranging from casual acquaintance to close familial bonds. Social networks operate on many levels, from families up to the level of nations, and play a critical role in determining the way problems are solved, organizations are run, and the degree to which individuals succeed in achieving their goals. Social networks also play a key role in hiring, in business success, and in job performance. Networks provide ways for companies to gather information, deter competition, and collude in setting prices or policies.

Social Network Analysis

Social network analysis is the study of social structure in terms of nodes and ties. It produces a view where the attributes of individuals are less important than their relationships and ties with other actors within the network. It is used to examine how organizations interact with each other, as well as associations and connections between individual employees at different organizations.

Social network analysis requires attribute data and is built on the collection and analysis of relational data. Attribute data is defined as data that reflects the attitudes, opinions, and behaviors of individuals or groups. Relational data refers to contacts, ties and connections, which relate one agent in a network to another. The majority of social network studies use either whole (Socio-centric) networks or egocentric study designs. Whole network studies assess relationships between individuals or actors that for analytical purposes are regarded as bounded or closed, even though in actuality the boundaries of the network are in fact permeable and/or ambiguous. When whole network studies are conducted, the focus of the study is to measure the structural patterns of how individuals within the network interact and how those patterns explain specific health outcomes. The underlying assumption made when whole network analysis is conducted, is that individuals that make up a group or social network will interact more than would a randomly selected group of similar size.

Graphs are visual representations of a network. Actors within a network are displayed as nodes and the lines connecting nodes are representative of the ties between two actors. Graphs can be directed, indicating the relationship is directed from one agent to the other, or valued, indicating the strength of the tie.

Social Media Network - Key Terms

Metrics (Measures) in social network analysis

Nodes and Ties

A social network is a social structure made of nodes (which are generally individuals or organizations) that are tied by one or more specific types of inter-dependency, such as values, visions, ideas, financial exchange, friends, kinship, likes, dislikes, conflict, trade, web links. Ties are assessed in terms of strength. Loose connections, like mere acquaintances (acquaintance: a person that we know but who is not a close friend), are called weak ties. Strong ties, like family bonds are called strong ties. There can be many kinds of ties between the nodes. They are the individual actors within the networks, and ties are the relationships between the actors. Ties are various types of connections between nodes.

Shape and Size

The shape and size of social networks influence their utility for their nodal participants. The shape of a social network helps determine a network's usefulness to its individuals.

Smaller, tighter networks composed of strong ties behave differently than larger, looser networks of weak ties. Participants in smaller networks are more likely to share values and information, increasing efficiency, but decreasing creativity. More open/larger/loose networks, with many weak ties and social connections, are more likely to introduce new ideas and opportunities to their members than closed networks. In other words, a group of friends who only do things with each other already share the same

knowledge and opportunities. While a group of individuals with connections to other social worlds is likely to have access to a wider range of information. It is better for individual success to have connections to a variety of networks rather than many connections within a single network. Individuals can exercise influence or act as brokers within their social networks by bridging two networks that are not directly linked (called filling structural holes).

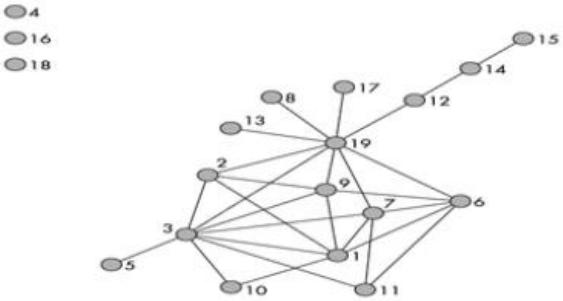
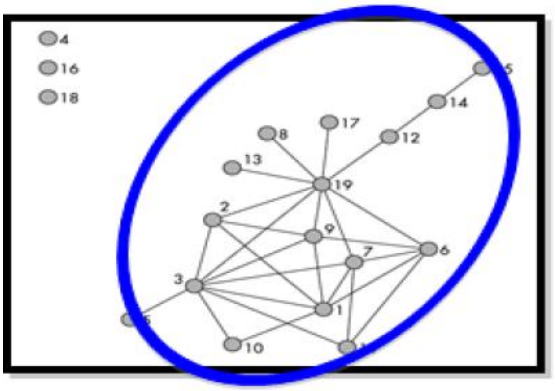


Figure 1 Graphical display of an interorganisational network with 19 actors.

Distance between points 15 and 11 is 5



Nodes 1, 6, and & 7 form a clique

Size:
The number of network members in a given network.

Cohesion:
Cohesion is the act or process of sticking together tightly. In the context of a network, cohesion generally refers to the degree of connectedness or the strength of relationships between nodes (such as devices, computers, or people) within the network. It can be thought of as a measure of how tightly the elements of a network are connected and how well they work together to maintain the integrity and functionality of the entire system.
Cohesion refers to the degree to which individuals (or nodes) in a social network are closely connected. A cohesive social network has many connections between its members, fostering collaboration, communication, and shared objectives.
Metrics of cohesion might include density (the number of actual connections divided by the total possible connections) and clustering coefficient (the degree to which nodes tend to cluster together).

Distance:
The length of the shortest path that connects two actors. The minimum number of ties required to connect two particular actors, as popularized by Stanley Milgram's small world experiment and the idea of 'six degrees of separation'.

Density:

The proportion of direct ties in a network relative to the total number possible.
Density = total number of relational ties divided by the total possible number of relational ties
Density refers to the "connections" between participants. Density is defined as the number of connections a participant has, divided by the total possible connections a participant could have. For example, if there are 20 people participating, each person could potentially connect to 19 other people. A density of 100% (19/19) is the greatest density in the system. A density of 5% indicates there is only 1 of 19 possible connections. The density statistic represents the proportion of possible relationships in the network that are actually present. The value ranges from 0 to 1, with the lower limit corresponding to networks with no relationships and the upper limit representing networks with all possible relationships. Density is usually defined as the sum of the values of all ties divided by the number of possible ties. That is, with valued data, density is usually defined as the average strength of ties across all possible (not all actual) ties.

Components and cliques:
Components and cliques measure properties of network subgroups
A component of a network (or graph) refers to a subgraph in which any two vertices are connected to each other by a path, and which is connected to no other vertices in the larger graph.
In simpler terms: A connected component is a group of nodes in the graph where there is a path between every pair of nodes. If a graph is disconnected, it can be broken down into multiple connected components, each of which is isolated from the others.
For example: In an undirected graph, if there is a group of nodes that are all reachable from each other, that group forms a component. If there are separate groups of nodes that aren't reachable from each other, each of those groups is a distinct component.
In a directed graph, the concept of components can be extended to strongly connected components (where there is a directed path in both directions between any two nodes) and weakly connected components (where there is an undirected path between any two nodes).

A clique in a graph is a subset of vertices such that every two vertices in the clique are connected to each other by an edge. In other words, a clique is a complete subgraph.
A clique of size k (or k-clique) is a set of k vertices where every pair of vertices in the set is connected by an edge.
A maximum clique is the largest clique within a graph, where no larger clique exists.
A clique number of a graph is the size of the largest clique in the graph.
For example:
In a social network graph, a clique can represent a group of people who are all directly connected to each other (e.g., all friends within a specific group).
If there is a subgraph in which every node is connected to every other node, that subgraph is a clique.

Path Length:
The distances between pairs of nodes in the network. Average path-length is the average of these distances between all pairs of nodes.

Centrality:
Characteristics of complete networks are defined in terms of centrality. Centrality measures identify the most prominent actors within a network. It can be conceptualized as either local or global. Local centrality refers to the direct ties a particular node has, while global centrality refers to the number of direct and indirect ties of a particular node. Centrality is measured in terms of betweenness or degree. Betweenness refers to the number of times an actor connects different subgroups of a network that would otherwise not be connected. In figure above, node 19 connects nodes 13, 8, 17, 12, 14, and 15 to the main network and serves as a prominent actor within the network. Centrality refers to a group of metrics that aim to quantify the "importance" or "influence" (in a variety of senses) of a particular node

(or group) within a network. Centrality focuses on the behavior of individual participants within a network. It measures the extent to which an individual interact with other individuals in the network. The more an individual connects to others in a network, the greater their centrality in the network.

The three main measures of centrality are:

Degree Centrality, Betweenness Centrality, and Closeness Centrality.

Degree Centrality:

Degree centrality refers to the sum of all actors that are directly connected to. It is the count of the number of ties to other actors in the network. Node number 19 has a degree centrality of 9, which is the highest in the socio-graph. Degree centrality is one of the easiest to calculate. The degree centrality of a node is simply its degree—the number of edges it has. The higher the degree, the more central the node is. This can be an effective measure, since many nodes with high degrees also have high centrality by other measures. The node with the highest degree in the network will have a degree centrality of 1, and every other node's centrality will be the fraction of its degree. For example, if the highest-degree node in a network has 50 edges, a node with 40 edges would have a degree centrality of 0.8=40/50.3

Betweenness Centrality:

Betweenness (or betweenness centrality) is a measure used in network analysis to quantify the importance of a node (or edge) within a network based on how often it appears on the shortest paths between other nodes. In other words, a node with high betweenness centrality acts as a bridge or gatekeeper in the flow of information (or other resources) across the network.

Betweenness centrality for a node is calculated as the number of shortest paths between pairs of nodes in the network that pass through the node of interest. Nodes with high betweenness centrality play a critical role in connecting different parts of the network. They are often located on many of the shortest paths between other nodes. These nodes can control the flow of information or resources because they serve as intermediaries between other nodes. If these nodes are removed, it might fragment the network or slow down communication between otherwise distant nodes.

Imagine a social network where each person is a node and each relationship is an edge. A person who knows many others and is frequently in the middle of conversations between different groups of people will have high betweenness centrality. If this person were to be removed from the network, many of the shortest communication paths between others might be disrupted.

Closeness Centrality:

The closeness indicates how close a node is to all other nodes in the network. It is the degree an individual is near all other individuals in a network (directly or indirectly). It refers to how quickly information can spread from a particular node (or vertex) to other nodes in the network. It is a measure of the "centrality" or "importance" of a node in terms of how close it is to all other nodes in the network.

Centralization:

A network configuration where participants must communicate with a central authority to communicate with one another. Since all participants must go through a single centralized source, the loss of that source would prevent all participants from communicating. A centralized network will have many of its links dispersed around one or a few nodes, while a decentralized network is one in which there is a little variation between the number of links each node possesses. A typical example of a centralized structure is a retail chain. Senior managers in the head office make vital decisions regarding product prices and inventory. Branch managers usually follow the agreed processes in operations, and store managers work according to these guidelines.

Overall Centralization:

The overall centralization measure refers to how tightly a graph is organized around its most central point.

Tie Strength:
Tie strength refers to a general sense of closeness with another person: Strong ties: the stronger links, corresponding to friends, dependable sources of social or emotional support; Weak ties: the weaker links, corresponding to acquaintances (a slight knowledge of somebody/something).
Defined by the linear combination of time, emotional intensity, intimacy and reciprocity (i.e. mutuality). Strong ties are associated with homophily, propinquity and transitivity, while weak ties are associated with bridges.

(Individual-level) density
Degree, a respondent's ties know one another/ proportion of ties among an individual's nominees. Network or global-level density is the proportion of ties in a network relative to the total number possible (sparse versus dense networks). Network density is calculated by dividing the number of actual connections by the number of possible connections, then multiplying by 100 to express it as a percentage.

Radiality
Radiality refers to a measure of how central or well-connected a particular node is within the network, particularly in relation to the overall structure of the network. It typically focuses on the concept of a node being centrally located, with many connections radiating outward to other nodes, like the spokes of a wheel.

Reach
Reach generally refers to the extent or scope of communication or connectivity that can be achieved across that network. It describes how far or how many different devices or nodes can be accessed, or how far a message or data packet can travel within the network. Reach refers to the ability of a device or node to communicate with other devices or nodes within the network. A network might be designed so that its reach extends to specific areas, such as a local area (LAN), a city, a region, or even globally (e.g., the Internet). In a WAN (Wide Area Network), the reach could be global, while in a LAN (Local Area Network), the reach would be limited to a local geographic area.

Structural cohesion
The minimum number of members who, if removed from a group, would disconnect the group.

Homophily:
The extent to which actors form ties with similar versus dissimilar others. Similarity can be defined by gender, race, age, occupation, educational achievement, status, values or any other salient characteristic.[31] Homophily is also referred to as assortativity.

Multiplexity:
The number of content-forms contained in a tie.[For example, two people who are friends and also work together would have a multiplexity of 2. Multiplexity has been associated with relationship strength and can also comprise overlap of positive and negative network ties.[9]

Mutuality/Reciprocity:
The extent to which two actors reciprocate each other's friendship or other interaction.

Network Closure:

A measure of the completeness of relational triads. An individual's assumption of network closure (i.e. that their friends are also friends) is called transitivity. Transitivity is an outcome of the individual or situational trait of Need for Cognitive Closure.

Propinquity:
The tendency for actors to have more ties with geographically close others.
Distributions[edit]

Structural holes:
The absence of ties between two parts of a network. Finding and exploiting a structural hole can give an entrepreneur a competitive advantage. This concept was developed by sociologist Ronald Burt, and is sometimes referred to as an alternate conception of social capital.

Bridge:
An individual whose weak ties fill a structural hole, providing the only link between two individuals or clusters/groups. It also includes the shortest route when a longer one is unfeasible due to a high risk of message distortion or delivery failure.

Segmentation
Groups are identified as 'cliques' if every individual is directly tied to every other individual, 'social circles' if there is less stringency of direct contact, which is imprecise, or as structurally cohesive blocks if precision is wanted.[45]

Clustering coefficient:
A measure of the likelihood that two associates of a node are associates. A higher clustering coefficient indicates a greater 'cliquishness'.[46]

Structural Equivalence:
Refers to the extent to which actors have a common set of linkages to other actors in the system. The actors don’t need to have any ties to each other to be structurally equivalent.

Structural Hole:
Static holes that can be strategically filled by connecting one or more links to link together other points. Linked to ideas of social capital: if you link to two people who are not linked you can control their communication.

Common Social Media Network Types:
Social media networks can be categorized based on their primary purpose and the way they connect users. Here are some common types of social media networks:

Social Networking Sites
These platforms are designed for users to create profiles, connect with friends or followers, and share content. **Examples**: Facebook, LinkedIn, Google+ (formerly)

Microblogging Platforms
These sites focus on short-form content such as quick updates, thoughts, and sharing news. **Examples**: Twitter, Tumblr, X (formerly Twitter)

Photo and Video Sharing Networks
These platforms allow users to share and view visual content like photos, videos, and GIFs. **Examples**: Instagram, Snapchat, Pinterest, YouTube, TikTok

Professional Networks
These networks are dedicated to connecting professionals, allowing them to network, share knowledge, and advance their careers. **Examples**: LinkedIn, Xing

Discussion Forums
These platforms are centered around users engaging in conversations, asking questions, and sharing ideas on various topics. **Examples**: Reddit, Quora, Stack Exchange

Messaging Apps
These are platforms focused on text, voice, and video communication between individuals or groups. **Examples**: WhatsApp, Telegram, Facebook Messenger, WeChat, Discord

Content Curation Networks
These platforms allow users to discover and share interesting articles, blog posts, and other media on specific topics. **Examples**: Pinterest, Flipboard, Pocket

Collaborative Platforms
These are social networks that focus on team collaboration, document sharing, and communication for businesses or organizations. **Examples**: Slack, Microsoft Teams, Trello

Live Streaming Platforms
These platforms allow users to broadcast live video content to their audience in real-time. **Examples**: Twitch, YouTube Live, Facebook Live

Social Bookmarking Networks
Users can save, organize, and share links to content that they find interesting or useful. **Examples**: Reddit (also functions as a discussion forum), Digg, Delicious

Interest-based Networks
These platforms connect users based on shared hobbies, passions, or interests, often organizing content around specific themes. **Examples**: Goodreads (books), Last.fm (music), Strava (fitness)

Virtual Worlds/Metaverse
These platforms provide immersive digital environments for users to interact with each other and digital spaces. **Examples**: Second Life, Roblox, Decentraland

Note: Each type serves a different purpose, catering to various user needs, from socializing and entertainment to professional networking and collaboration.

Social Media Network Analysis

Social network analysis (SNA) is the process of investigating social structures through the use of networks and graph theory. It characterizes networked structures in terms of nodes (individual actors, people, or things within the network) and the ties, edges, or links (relationships or interactions) that connect them. Social network analysis has emerged as a key technique in modern sociology. The advantages of SNA are twofold. Firstly, it can process a large amount of relational data and describe the overall relational network structure. By analyzing nodes, clusters and relations, the communication structure and position of individuals can be clearly described.

Modelling and Visualization of Networks:

Visual representation of social networks is important to understand the network data and convey the result of the analysis. Numerous methods of visualization for data produced by social network analysis have been presented. Many of the analytic software have modules for network visualization. Exploration of the data is done through displaying nodes and ties in various layouts, and attributing colors, size and other advanced properties to nodes. Visual representations of networks may be a powerful method for conveying complex information, but care should be taken in interpreting node and graph properties from visual displays alone, as they may misrepresent structural properties better captured through quantitative analyses. Signed graphs can be used to illustrate good and bad relationships between humans. A positive edge between two nodes denotes a positive relationship (friendship, alliance, dating) and a negative edge between two nodes denotes a negative relationship (hatred, anger). Signed social network graphs can be used to predict the future evolution of the graph. In signed social networks, there is the concept of "balanced" and "unbalanced" cycles. A balanced cycle is defined as a cycle where the product of all the signs are positive. According to balance theory, balanced graphs represent a group of people who are unlikely to change their opinions of the other people in the group. Unbalanced graphs represent a group of people who are very likely to change their opinions of the people in their group. For example, a group of 3 people (A, B, and C) where A and B have a positive relationship, B and C have a positive relationship, but C and A have a negative relationship is an unbalanced cycle. This group is very likely to morph into a balanced cycle, such as one where B only has a good relationship with A, and both A and B have a negative relationship with C. By using the concept of balanced and unbalanced cycles, the evolution of signed social network graphs can be predicted.
Especially when using social network analysis as a tool for facilitating change, different approaches of participatory network mapping have proven useful. Here participants / interviewers provide network data by actually mapping out the network (with pen and paper or digitally) during the data collection session. An example of a pen-and-paper network mapping approach, which also includes the collection of some actor attributes (perceived influence and goals of actors) is the * Net-map toolbox. One benefit of this approach is that it allows researchers to collect qualitative data and ask clarifying questions while the network data is collected.

Practical applications:

Social network analysis is used extensively in a wide range of applications and disciplines.
Some common network analysis applications include data aggregation and mining, network propagation modeling, network modeling and sampling, user attribute and behavior analysis, community-maintained resource support, location-based interaction analysis, social sharing and filtering, recommender systems development, and link prediction and entity resolution.

In the private sector, businesses use social network analysis to support activities such as customer interaction and analysis, information system development analysis, marketing, and business intelligence needs (see social media analytics).

Some public sector uses include development of leader engagement strategies, analysis of individual and group engagement and media use, and community-based problem solving.

Longitudinal Social Network Analysis in Schools

Large numbers of researchers worldwide examine the social networks of children and adolescents. In questionnaires, they list all classmates, students in the same grade, or schoolmates, asking: “who are your best friends?”. Students may sometimes nominate as many peers as they wish; other times, the number of nominations is limited. Social network researchers have investigated similarities in friendship networks. The similarity between friends was established as far back as classical antiquity.[63] Resemblance is an important basis for the survival of friendships. Similarity in characteristics, attitudes, or behaviors means that friends understand each other more quickly, have

common interests to talk about, know better where they stand with each other, and have more trust in each other.[64] As a result, such relationships are more stable and valuable. Moreover, looking more alike makes young people more confident and strengthens them in developing their identity.[65] Similarity in behavior can result from two processes: selection (birds of a feather flock together) and influence (one rotten apple spoils the barrel). These two processes can be distinguished using longitudinal social network analysis in the R package SIENA (Simulation Investigation for Empirical Network Analyses), developed by Tom Snijders and colleagues.[66] Longitudinal social network analysis became mainstream after the publication of a special issue of the Journal of Research on Adolescence in 2013, edited by René Veenstra and containing 15 empirical papers.[67]

Security Applications

Social network analysis is also used in intelligence, counter-intelligence and law enforcement activities. This technique allows the analysts to map covert organizations such as an espionage ring, an organized crime family or a street gang. The National Security Agency (NSA) uses its electronic surveillance programs to generate the data needed to perform this type of analysis on terrorist cells and other networks deemed relevant to national security. The NSA looks up to three nodes deep during this network analysis.[68] After the initial mapping of the social network is complete, analysis is performed to determine the structure of the network and determine, for example, the leaders within the network.[69] This allows military or law enforcement assets to launch capture-or-kill decapitation attacks on the high-value targets in leadership positions to disrupt the functioning of the network. The NSA has been performing social network analysis on call detail records (CDRs), also known as metadata, since shortly after the September 11 attacks.[70][71]

Textual Analysis Applications

Large textual corpora can be turned into networks and then analyzed with the method of social network analysis. In these networks, the nodes are Social Actors, and the links are Actions. The extraction of these networks can be automated by using parsers. The resulting networks, which can contain thousands of nodes, are then analyzed by using tools from network theory to identify the key actors, the key communities or parties, and general properties such as robustness or structural stability of the overall network, or centrality of certain nodes.[72] This automates the approach introduced by Quantitative Narrative Analysis,[73] whereby subject-verb-object triplets are identified with pairs of actors linked by an action, or pairs formed by actor-object.

In other approaches, textual analysis is carried out considering the network of words co-occurring in a text. In these networks, nodes are words and links among them are weighted based on their frequency of co-occurrence (within a specific maximum range).

Internet Applications

Social network analysis has also been applied to understanding online behavior by individuals, organizations, and between websites. Hyperlink analysis can be used to analyze the connections between websites or webpages to examine how information flows as individuals navigate the web.[75] The connections between organizations has been analyzed via hyperlink analysis to examine which organizations within an issue community.[76]

Netocracy

Another concept that has emerged from this connection between social network theory and the Internet is the concept of netocracy, where several authors have emerged studying the correlation between the extended use of online social networks, and changes in social power dynamics.

Social media internet applications
Social network analysis has been applied to social media as a tool to understand behavior between individuals or organizations through their linkages on social media websites such as Twitter and Facebook.[78]

Benefits of Social Network Analysis:
There are two benefits of social network analysis. It may first characterize the overall topology of the relational network and analyze a significant amount of relational data. In terms of construction safety, the likelihood that an accident may spark a broad spectrum of public discourse increases with its severity. Through large data mining, social network analysis can display the vast network of all people taking part in public discourse as well as its internal organization. Since social network analysis places more emphasis on relationships than on separate people or organizations, this approach enables to look at the "two-way dialogue between the organization and the public." Second, SNA gives researchers the ability to choose parameters and a customizable measurement system to validate the network's influential nodes, including in-degree and out-degree centrality. SNA gives researchers the flexibility to select parameters based on the context of their study and define the "center" based on the properties of the network. It is possible to characterize the communication structure and individual positions by examining nodes, clusters, and relations.

Network Analytics Tools:
Network analytics tools help monitor, analyze, and optimize network performance by providing insights into various network operations. These tools can identify issues, troubleshoot performance bottlenecks, and improve network security. Here are some of the most popular and widely used network analytics tools:
Wireshark:
Type: Packet Sniffer/Analyzer
Description: Wireshark is one of the most popular open-source network protocol analyzers. It captures and inspects network traffic in real-time, enabling users to analyze packets and troubleshoot network issues.
Key Features: Deep packet inspection, Real-time capture and analysis, Protocol decoding, Detailed filtering capabilities

SolarWinds Network Performance Monitor (NPM)
Type: Network Monitoring and Analytics
Description: SolarWinds NPM provides advanced network monitoring, including performance analytics, root cause analysis, and network topology visualization.
Key Features: Real-time monitoring, Network performance insights, Intelligent alerting and reporting, Bandwidth usage analysis

PRTG Network Monitor
Type: Network Monitoring and Analytics
Description: PRTG offers a comprehensive suite for network monitoring, providing metrics like bandwidth usage, traffic analysis, and network health.
Key Features: Traffic monitoring via SNMP, NetFlow, and other protocols, Real-time dashboards, Alerts and custom reports, Scalability for large networks
Nagios
Type: Network Monitoring and Performance Management
Description: Nagios is an open-source network monitoring tool that provides comprehensive network monitoring, including real-time alerts and logs.
Key Features: Customizable plugins, Real-time monitoring and alerting, Resource consumption tracking, Extensive reporting and logging

NetFlow Analyzer
Type: Traffic Analytics
Description: NetFlow Analyzer by ManageEngine focuses on network traffic analysis, providing insights into bandwidth consumption, application performance, and network topology.
Key Features: Flow data collection and analysis, Bandwidth monitoring, Application performance monitoring, Security and threat detection

Zabbix
Type: Network Monitoring and Analytics
Description: Zabbix is an open-source network monitoring platform that provides real-time monitoring and alerting for network devices, servers, and applications.
Key Features: Real-time performance monitoring, Customizable dashboards and reports, Extensive alerting system, Data collection via SNMP, JMX, IPMI, and other protocols

Ntopng
Type: Network Traffic Analytics
Description: Ntopng is a network traffic analyzer that provides deep insights into network traffic flows, such as application protocols, traffic patterns, and network performance.
Key Features: Real-time traffic flow analysis, Detailed application and protocol monitoring, Network performance dashboards, Security monitoring capabilities

Cacti
Type: Network Monitoring
Description: Cacti is an open-source network graphing tool that leverages the SNMP protocol for collecting data and generating graphical representations of network metrics.
Key Features: Graphical visualization of network performance, Customizable templates and reports, SNMP-based data collection, Network device monitoring

Dynatrace
Type: Application Performance and Network Monitoring
Description: Dynatrace offers full-stack monitoring, providing insights into application performance, user experience, and network monitoring.
Key Features: AI-driven monitoring, End-to-end network performance monitoring, Real-time application and infrastructure insights, Automatic detection of issues and root cause analysis

Cisco Network Assistant
Type: Network Management and Analytics
Description: Cisco Network Assistant provides network monitoring and management tools for small to medium-sized Cisco network infrastructures.
Key Features: Centralized network management, Performance monitoring for Cisco devices, Simplified configuration and troubleshooting, Device health monitoring

WiFi Explorer
Type: Wi-Fi Network Analyzer
Description: WiFi Explorer specializes in analyzing Wi-Fi networks, offering insights into signal strength, interference, and performance for optimizing wireless networks.
Key Features: Signal strength visualization, Channel interference detection, Detailed wireless network diagnostics, Wi-Fi network performance assessment

OpenNMS

Type: Network Monitoring
Description: OpenNMS is an open-source network management platform that provides monitoring, alerting, and reporting across large-scale networks.
Key Features: Network performance monitoring, Customizable event management, Scalability for enterprise environments, Service and availability monitoring

Datadog
Type: Cloud Infrastructure and Network Monitoring
Description: Datadog offers cloud-based monitoring for applications, infrastructure, and network systems, providing insights into performance and security.
Key Features: Real-time monitoring and alerting, Advanced analytics with machine learning, Network performance visibility, Integration with other cloud services and platforms

Ixia Network Analyzer
Type: Network Performance and Security Testing
Description: Ixia provides advanced network testing and analysis tools, including traffic generation, monitoring, and performance benchmarking.
Key Features: Network stress testing, Real-time performance monitoring, Advanced security testing, Load and traffic analysis

Packet Tracer
Type: Network Simulation and Analytics
Description: Developed by Cisco, Packet Tracer is a network simulation tool that allows users to create and analyze virtual networks for educational and troubleshooting purposes.
Key Features: Virtual network building and testing, Packet-level simulation, Visualization of network traffic, Educational tool for network professionals

Conclusion:
These network analytics tools vary in scope, from basic packet analysis to comprehensive monitoring and traffic analysis for both small and large-scale networks. Depending on your network's requirements—whether for monitoring bandwidth, securing traffic, troubleshooting, or optimizing performance—these tools offer powerful features to improve overall network management.