Application Development

SPARK Matrix™ :

Software Composition Analysis (SCA), 2022

Market Insights, Competitive Evaluation, and Vendor Rankings

August 2022

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Executive Overview

This research service includes a detailed analysis of global Software Composition Analysis (SCA) solution market dynamics, major trends, vendor landscape, and competitive positioning analysis. The study provides competition analysis and ranking of the leading SCA vendors in the form of SPARK Matrix. This research provides strategic information for technology vendors to better understand the market supporting their growth strategies and for users to evaluate different vendors capabilities, competitive differentiation, and its market position.

Market Definition and Overview

Software Composition Analysis (SCA) software automate the process of analyzing the inhouse applications throughout the application development process for security risks, vulnerabilities and potential quality issues associated with the embedded open-source software (OSS) and other commercial off-the-shelf (COTS) components within the code of the proprietary application. SCA tools typically identify and prioritize risk, alert IT security and development teams, in order to eliminate security risks and concerns before any kind of damage is done. They may also analyze the distribution license of the components to determine any associated legal compliance risks. SCA tools can also have added capabilities for analyzing operational and maintenance risks and project viability.

With the emergence of completely digital method of work, the demand for innovation in software and application development is ever increasing. The requirement of high accuracy, fast pace of software and application rollout, quick adoption of fast changing trends, frequent customization and modifications and cost constraints make development of an application or software from ground up infeasible. The organizations depend on tried and tested commercial off-the shelf and open-source software components to meet these requirements, thus, use of third-party software elements within an inhouse software or application has become part of development process. Along with the convenience, these third-party software elements bring with them multiple risks and vulnerabilities which leaves the DevSecOps professionals to figure out how to maintain the pace of development without sacrificing with the security, quality, and viability of the software.

The current SCA products analyze the embedded OSS and COTS components for vulnerabilities and risks related to security, code quality, license compliance and long-term project viability. The capabilities provided by SCA products includes proprietary and third-party code scanning for embedded OSS and COTS software, vulnerability prioritization, integration into the DevSecOps ecosystem, operational risk management and Software Bill of Materials (SBOM) builder.

SCA products scan the base code as well as the development environment to discover and analyze the open-source codes embedded within the OSS and COTS used. They prioritize the vulnerabilities found in this third-party code depending upon the risk they bring to the software. SCA software can be integrated with the DevSecOps ecosystem from the initial stage of development to the point of deployment and maintenance

ensuring security during the entire Software Development Life Cycle (SDLC). It also scans the third-party software for operational risks including maintenance and long-term support to ensure that the software can be serviced for long term without any major changes required. With SBOM builder the SCA software provides the list of all the OSS and COTS software used in the inhouse software development and generate a database of these vulnerabilities for audit purposes. SBOM system may also be capable of including not just the vulnerabilities from the government vulnerability database but also the vulnerabilities that are just disclosed.

Following are the key capabilities of Software Composition Analysis solution:

- **Scan and Discover Embedded Third-Party Software:** SCA software scan the code to identify the third-party components like OSS and COTS software that have been included as a part of the development process. Software developers use these third-party components to speed up the development process and to avoid doing repetitive tasks, but these components are many times composed of other third-party components which bring their own risks and vulnerabilities to the software and thus, remediation and resolution of any such risks, are of utmost importance for the stability and security of the software. SCA software discovers all the hidden, embedded and initially undeclared OSS and COTS components and reports back to the user. The user can now take the necessary steps of the remediation of the vulnerabilities associated with these components.

- **Vulnerability Identification:** SCA software scans the codes for known vulnerabilities which are included in the vulnerability inventory that is a part of the SCA software. The software recognizes the vulnerability that is present within the code and reports back the code component that contains that vulnerability this enables the developers to know the exact location of the risk and remediate at the earliest. Thus, reducing the time required for the resolution of risks.

- **License Governance:** The OSS and COTS software components are accompanied by license distribution and usage rules and regulation, which if not considered while software development might result into legal issues and thus compliance of the licenses is extremely important for developers. SCA software ensures that all the license compliance requirements are known to the developer.

- **Software Development Process Integration:** The complexity of the code increases as it moves through the steps SDLC and resolution of issues, bugs and security risks becomes difficult with each step. Thus, resolution of issues as soon as it occurs within the code is necessary. SCA software can be integrated with SDLC and allow the developers to shift left the risk mitigation right from the kick-

off of the development process. The software scans the code whenever a new segment of cade is added to the proprietary code and reports the third-party components and the associated risks and vulnerabilities, ensuring that the developer is aware of the issues and can remediate at the earliest.

Competitive Landscape and Analysis

Quadrant Knowledge Solutions conducted an in-depth analysis of major software composition analysis vendors by evaluating their products, market presence, and customer value proposition. The evaluation is based on the primary research with expert interviews, analysis of use cases, and Quadrant's internal analysis of the overall market. This study includes an analysis of key vendors, including CAST, Checkmarx, Contrast Security, Finite State, FOSSA, GitLab, GrammaTech, JFrog, Mend, Revenera, ReversingLabs, Snyk, Sonatype, Synopsys, and Veracode.

Sonatype, Synopsys, Mend, CAST, and Veracode are the top performers and technology leaders in the software composition analysis solutions market. These companies provide a sophisticated and comprehensive technology platform to address a variety of SCA use cases.

Sonatype's SCA software, Nexus suite offers Nexus Repository, a comprehensive database of opensource binaries, which enables the developers to manage all their opensource packages at one place. It provides robust integrations capabilities which enables the developers to incorporate with their existing CI/CD pipelines seamlessly. Synopsys SCA software, Black Duck offers KnowledgeBase which is a comprehensive inventory of open-source software, open-source licenses and related vulneraries, it is not limited by the national vulnerability database. It also provides Black Duck Security Advisories which provides same-day notification of newly reported vulnerabilities and various exclusive vulnerabilities that are researched and analyzed by the Synopsys Cybersecurity Research Center (CyRC) which uses KnowledgeBase for extensive coverage of all kinds of vulnerabilities.

Mend's SCA technology offers a strong network of partners that provide sales and service for its application security suite. The company provides a robust SBOM system which includes an extensive database of vulnerabilities. It provides the exact path through which the dependencies containing vulnerabilities are called and provides a great benefit for the developer to quickly resolve the issues. CAST SCA technology offers Portfolio Advisor for Open Source that rapidly prioritizes applications with open source and third-party components according to the risks across the organization's application portfolio and provides automated recommendations for remediation, in the business context of the organization.

Veracode provides a unified platform, Continuous Software Security Platform (CSSP) that offers a broad testing suite for continuous testing and monitoring throughout the software

development lifecycle. Multiple methods of analysis examine software artifacts to identify and assess potential security vulnerabilities, providing a 360-degree view of an organization's security posture. for the overall application security. GitLab SCA technology offers integration with various containers and support for most of the coding languages and package mangers. It has a global workforce that continues to develop it's technologies.

Snyk Open Source SCA offers fix recommendation system which recommends the minimal upgrades required to clear direct vulnerabilities, accelerating triaging of transitive vulnerabilities. It allows the developer to automate the remediation process with a one-click fix pull request which generates the required upgrades and patches and integrates them into a pull request which is available to merge into the entire development process. Checkmarx's SCA offers Checkmarx Vulnerability Database which includes all the vulnerabilities available in the public domain and have constant addition to the database from the vulnerabilities discovered by Checkmarx's in-house AppSec experts. It provides integration capability it provides with multiple integrated development environments (IDEs), source code management, CI/CD platforms, feedback platforms, and cloud providers.

Key Competitive Factors and Technology Differentiators

The following are the key competitive factors and differentiators for the evaluation of software composition analysis solutions and vendors. While the majority of SCA solutions may provide all the core functionalities, the breadth and depth of functionalities may differ by different vendors' offerings. Driven by increasing competition, vendors are increasingly looking at improving their technology capabilities and overall value proposition to remain competitive. Some of the key differentiators include:

- **Unified Application Security Suite:** Users may prefer vendors that not only provides SCA for the OSS and third-party software security but for the in-house proprietary code. A vendor should provide an integrated security solution which includes features like Static application security testing (SAST), Dynamic application security testing (DAST), Interactive application security testing (IAST), and SCA for the security of the project for the entirety of SDLC.

- **Automated and Customizable Scanning:** The SCA should provide automated continuous scanning capabilities which scan the project for vulnerabilities when the developers end the editing session. It should provide customizability to the developer to scan for parts of the code according to one's requirements.

- **Operational Risk Management:** The ability of SCA to scan for components that do not have ongoing maintenance support from the OSS & third-party vendors and have not received version updates & vulnerability fixes is extremely important to keep the project secure. A user must ensure that the SCA software provides this capability to prevent outdated software components from being included in the project code.

- **Exploitable Path Availability:** The user should evaluate whether SCA software vendors provides the feature which makes the exploitable path available to the developer, displaying the exact path how the dependency containing the vulnerability is being called. The vulnerability might be present in a transitive dependency and might have no remediation available in the latest version. If the developer is not able to view the exploitable path, they will have to remove the direct dependency itself. If the path is available, the developer can remediate each individual vulnerability, going through the exploitable path starting from the transitive dependency containing the vulnerability to the direct dependency.

- **Software Bill of Materials (SBOM):** The SCA software should provide a SBOM which includes not only the direct dependencies but also the transitive dependencies which are being called not directly by the user but by the OSS or third-party component used in the code. The user should check if the SCA software is able to produce a SBOM for sharing and integration into other systems (e.g., software asset management, configuration management database).

- **Vendor Specific Vulnerability Database:** A SCA software is dependent on a vulnerability database to be able to scan and report for vulnerabilities. Most software uses the National Vulnerability Database (NVD) to scan for vulnerabilities, but there is a considerable time lag from when a vulnerability is disclosed to when it is added to NDV. The vendor provides a custom vulnerability database where vulnerabilities are added as and when they are disclosed publicly. Vendors also have research teams that constantly work to discover new vulnerabilities and update them into the database, preventing zero-day attacks. Users should evaluate the vendors that provide a custom vulnerability database that is integrated with their SCA software.

- **OSS and Third-party license management:** There are a huge variety of license distribution and usage compliances that are applicable on third party codes. Hence, for a SCA software to be able to recognize more license compliances becomes very important to ensure that there are minimum legal risks related to the usage and distribution of the third-party codes and become an important differentiator for selection of an SCA software. The SCA software should be able to scan for outdated license and provide the information about updated licenses.

- **Policy Governance & Customizability:** The ability to customize the security policies for prioritization of security risks, for project management and the usage of the OSS and third-party software allows the developer to use the third-party software according to security policies of the company. Users should evaluate the vendors based on the level of governance control and customizability the SCA software provides.

- **Comprehensive Integration Capabilities:** The complexity of the code increases as it moves through the steps of SDLC and resolution of issues, bugs and security risks becomes difficult with each step. Thus, resolution of issues as soon as it occurs within the code is necessary. SCA software can be integrated with SDLC and allow the developers to shift left the risk mitigation right from the kick-off of the development process. Thus, a SCA software should have extensive integrations, should be able to integrate with multiple integrated development environments (IDEs), source code management, CI/CD platforms, feedback platforms, and cloud providers. This allows the developers to easily add the SCA into their current workflow with doing any major changes.

- **Multiple Programming Language Support:** Most SCA software support certain specific programming language. This limits the scalability of a single SCA software in terms of securing a variety of software and applications as well as also limits the capability of SCA software to perform evaluation of vulnerabilities. Such tools are usually unable to check for operational risks associated with the use of third-party software. Thus, user should ensure that SCA software has support for maximum programming language so that with a single SCA software multiple software and applications.

- **Support for Reporting Standards:** The user needs to view the generated reports using the open standards for communicating SBOM like Software Package Data Exchange [SPDX], Software ID Tag [SWID] and CycloneDX. The user should check which of the above standards the SCA software supports, the software should support multiple standards.

- **The Sophistication of Technology:** Organizations are advised to conduct a comprehensive evaluation of different software composition analysis software vendors before making a purchasing decision. Users should employ a weighted analysis of several factors important to their specific organizational need. The key features required by organizations for software composition analysis may differ based on the industry vertical and user size. Users should also look for software composition analysis vendors with a history of successful large-scale deployments and carefully analyze the existing case studies of those deployments. This should form the basis to prepare best policies for software composition analysis software deployments. Software composition analysis software capabilities differ from vendor to vendor in terms of ease of deployment & use, technology integration.

- **Scalability:** Driven by the ever-growing volume and variety of software being developed across the globe, users should evaluate software composition analysis software that offer enterprise-grade scalability. The user should look for software composition analysis software that can secure software from various types of vulnerabilities and license & operational risks. Users must carefully examine vendors that can keep up with growing demand for software while also making upgrades and changes easily.

- **Pricing Model:** Organizations are evaluating software composition analysis vendors based on their competitive pricing models in order to reduce costs. This is one of the major considerations that all vendors must consider to gain a competitive advantage over their competitors. Users should assess vendors that provide a flexible pricing structure and offer the highest value relative to their cost.

SPARK Matrix™: Strategic Performance Assessment and Ranking

Quadrant Knowledge Solutions' SPARK Matrix provides a snapshot of the market positioning of the key market participants. SPARK Matrix provides a visual representation of market participants and provides strategic insights on how each supplier ranks related to their competitors, concerning various performance parameters based on the category of technology excellence and customer impact. Quadrant's Competitive Landscape Analysis is a useful planning guide for strategic decision makings, such as finding M&A prospects, partnership, geographical expansion, portfolio expansion, and similar others.

Each market participants are analyzed against several parameters of Technology Excellence and Customer Impact. In each of the parameters (see charts), an index is assigned to each supplier from 1 (lowest) to 10 (highest). These ratings are designated to each market participant based on the research findings. Based on the individual participant ratings, X and Y coordinate values are calculated. These coordinates are finally used to make SPARK Matrix.

Technology Excellence	Weightage
Sophistication of Technology	20%
Competitive Differentiation Strategy	20%
Application Diversity	15%
Scalability	15%
Integration & Interoperability	15%
Vision & Roadmap	15%

Customer Impact	Weightage
Product Strategy & Performance	20%
Market Presence	20%
Proven Record	15%
Ease of Deployment & Use	15%
Customer Service Excellence	15%
Unique Value Proposition	15%

Evaluation Criteria: Technology Excellence

- **The sophistication of Technology**: The ability to provide comprehensive functional capabilities and product features, technology innovations, product/platform architecture, and such others

- **Competitive Differentiation Strategy**: The ability to differentiate from competitors through functional capabilities and/or innovations and/or GTM strategy, customer value proposition, and such others.
- **Application Diversity**: The ability to demonstrate product deployment for a range of industry verticals and/or multiple use cases.
- **Scalability**: The ability to demonstrate that the solution supports enterprise-grade scalability along with customer case examples.
- **Integration & Interoperability**: The ability to offer product and technology platform that supports integration with multiple best-of-breed technologies, provides prebuilt out-of-the-box integrations, and open API support and services.
- **Vision & Roadmap**: Evaluation of the vendor's product strategy and roadmap with the analysis of key planned enhancements to offer superior products/technology and improve the customer ownership experience.

Evaluation Criteria: Customer Impact

- **Product Strategy & Performance**: Evaluation of multiple aspects of product strategy and performance in terms of product availability, price to performance ratio, excellence in GTM strategy, and other product-specific parameters.
- **Market Presence**: The ability to demonstrate revenue, client base, and market growth along with a presence in various geographical regions and industry verticals.
- **Proven Record**: Evaluation of the existing client base from SMB, mid-market and large enterprise segment, growth rate, and analysis of the customer case studies.
- **Ease of Deployment & Use**: The ability to provide superior deployment experience to clients supporting flexible deployment or demonstrate superior purchase, implementation and usage experience. Additionally, vendors' products are analyzed to offer user-friendly UI and ownership experience.
- **Customer Service Excellence**: The ability to demonstrate vendors capability to provide a range of professional services from consulting, training, and support. Additionally, the company's service partner strategy or system integration capability across geographical regions is also considered.

- **Unique Value Proposition**: The ability to demonstrate unique differentiators driven by ongoing industry trends, industry convergence, technology innovation, and such others.

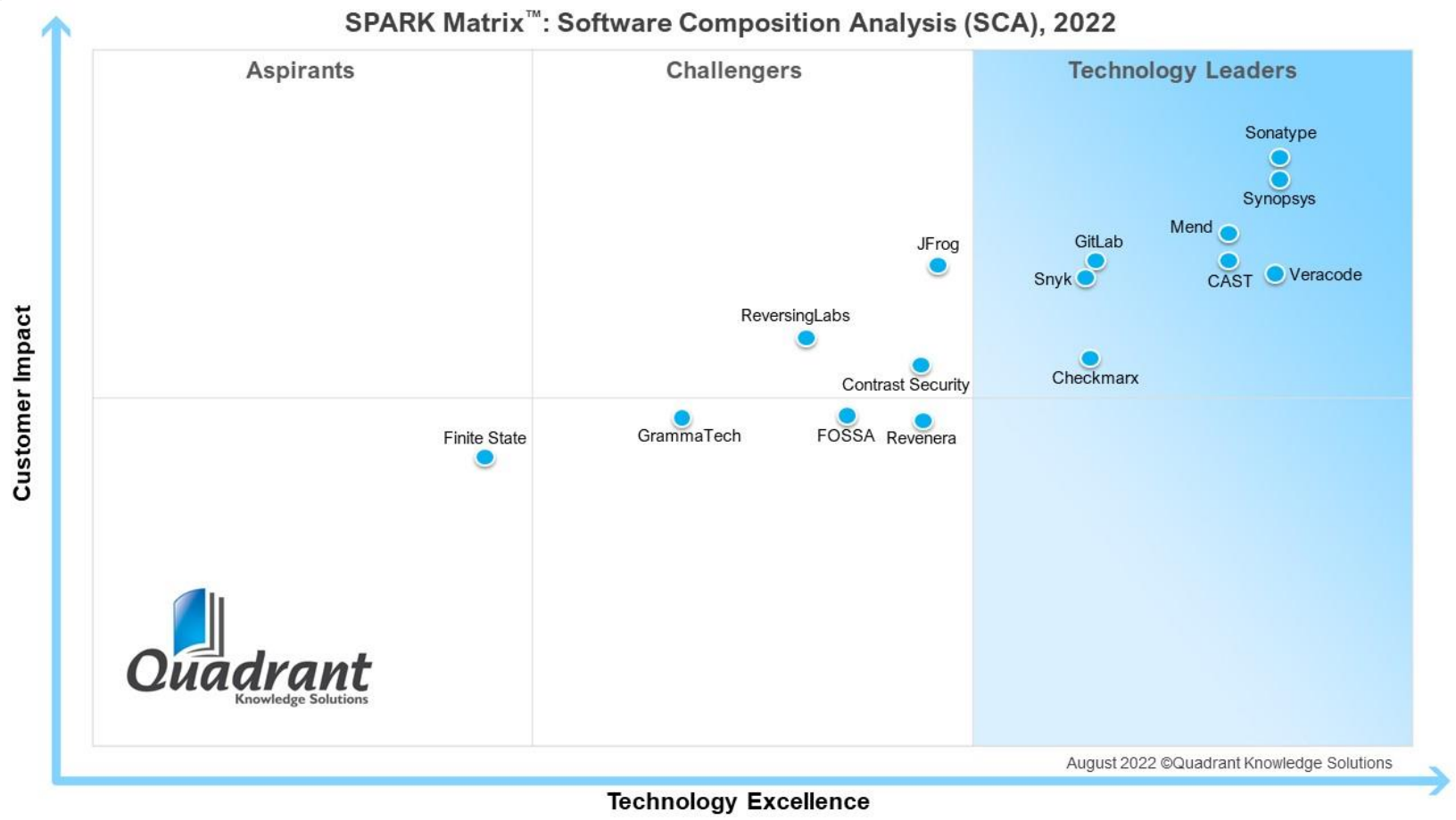
SPARK Matrix™:

Software Composition Analysis (SCA), 2022

Strategic Performance Assessment and Ranking

Figure: 2022 SPARK Matrix™

(Strategic Performance Assessment and Ranking)
Software Composition Analysis (SCA) Market



Vendors Profile

Following are the profiles of the leading software composition analysis solution vendors with a global impact. The following vendor profiles are written based on the information provided by the vendor's executives as part of the research process. Quadrant research team has also referred to the company's website, whitepapers, blogs, and other sources for writing the profile. A detailed vendor profile and analysis of all the vendors, along with various competitive scenarios, are available as a custom research deliverable to our clients. Users are advised to directly speak to respective vendors for a more comprehensive understanding of their technology capabilities. Users are advised to consult Quadrant Knowledge Solutions before making any purchase decisions, regarding software composition analysis technology and vendor selection based on research findings included in this research service.

CAST

URL: https://www.castsoftware.com/

Founded in 1990 and headquartered in New York, USA and Paris, France, CAST products provide intelligence about the inner workings of custom-built software, including software composition, cloud readiness, structural flaws, architecture blueprints, sizing metrics, and enhancing the quality grades of the software through its product portfolio. CAST offers SCA capabilities through CAST Highlight, which provides various key features and functionalities, including automated open source and third-party component detection, rapid application deployment, automated priority recommendations, security vulnerability insights, IP and licensing insights, security weakness insights, technology obsolescence insights, transitive dependencies, auto-generated software bill of materials (SBOM), browser extension, support for 50+ technologies and programming languages, application benchmarks, progress tracking, custom surveys, custom indicators & dashboards, CI/CD DevOps connection, public REST API, and out-of-the-box integrations with 3rd parties, such as Jira, Azure DevOps, GitHub, etc.

CAST Highlight provides automated open source and third-party component and framework detection and on-going analysis, across all applications in a portfolio. It uses a proprietary knowledge base, which includes over 100 million OSS components. It utilizes Open-Source Safety Score to prioritize remediation efforts across entire portfolios and focuses on the most business-critical applications to be remediated first. CAST Highlight provides rapid deployment across the entire portfolio of applications by simply installing a local analyzer and pointing it at the source code repositories. The analyzer then feeds SaaS intuitive dashboards to provide insights across the portfolio down to individual applications and components.

CAST Highlight offers automated recommendations which prioritize applications with open-source and third-party component risks across the application portfolio and provides automated remediation steps. It automatically identifies and provides security vulnerability insights about all common vulnerabilities and exposures (CVEs) that pose security risks at the portfolio and application levels. It also sends automated email notifications on newly discovered CVEs. CAST Highlight provides IP and licensing insights by detecting all the licenses used across the application portfolio and identifying the possible associated legal issues. It allows developers to customize the license profile policy in accordance with their organization’s specific requirements.

In addition, CAST Highlight uses CAST's proprietary Open-Source Software Intelligence Database (OSSIDB) to provide security weakness insights. It automatically identifies common weakness enumeration (CWE) flaws that represent possible future vulnerabilities, not yet reported officially as CVEs in the National Vulnerability Database (NVD). CAST Highlight detects the applications that use vulnerable obsolete component versions and recommends the safer versions of these components. It detects the transitive dependencies and the associated open-source vulnerability and license risks and provides insights into the remediation of these risks and vulnerabilities. It provides auto-generated Software Bill of Materials (SBOM) that can be automatically exported in various industry standards and flexible options such as CycloneDX, Word, Excel, PPT, XML, and REST API.

CAST Highlight offers a browser extension for Chrome and Edge, which enables the developers to get open-source component information, such as the available versions, allow/deny status, and the associated vulnerabilities and license risks, directly in the browser when visiting component repository websites. It provides support for over 50 technologies and a vast variety of programming languages such as Ada, Assembler, C#, C/C++, Clojure, COBOL, Coffeescript, Coldfusion, DB2, Delphi, Erlang, Java, JavaScript, JSP, Kotlin, Microsoft Transact-SQL, Python, Swift, TypeScript, and VB.Net. It benchmarks applications against thousands of applications on various metrics using dimensions such as technology and application type. It enables application owners to track the progress of the application over time to understand if health, cloud readiness, and open-source safety are improving across the portfolio and for each application.

CAST Highlight provides customizable surveys that enable qualitative data to be factored into more contextualized analysis of the portfolio. It offers custom indicators and dashboards where application owners can define custom calculations and reporting to develop tailored views. It provides various CI/CD DevOps connections, allowing teams to connect with any CI/CD pipeline or DevOps toolchain and through a configurable command line they can automate the source code analysis. It offers a public Rest API that enables organizations to extract key metrics and integrate them with other systems such as enterprise architecture (EA), application portfolio management (APM), or project portfolio management (PPM) platforms. CAST Highlight offers various out-of-the-box integrations, including turnkey extensions for GitHub, BitBucket, Azure DevOps, and Jira to automate code scanning and automatically create tickets based on software intelligence.

Analyst Perspective

Following is the analysis of CAST's capabilities in the software composition analysis (SCA) market:

- CAST Highlight allows application owners to use OSS and third-party code components in the proprietary code throughout their application portfolio without risking the security of the code due to the direct and transitive dependencies of the OSS and third-party code. CAST Highlight is a highly secured SaaS platform certified by ISO 27001, which allows its clients to store the analysis results in a client-reserved cloud, hosted on AWS, Microsoft Azure, or Google Cloud, without requiring to upload the source code or database scripts to the cloud. It is capable of rapidly analyzing large portfolios of thousands of applications.

- Some of the key differentiators of CAST include the Portfolio Advisor for Open Source that rapidly prioritizes applications with open source and third-party components according to the risks across the organization's application portfolio and provides automated recommendations for remediation, in the business context of the organization. It provides access to CAST's Open-Source Software Intelligence Database (OSSIDB) that enables CAST Highlight to identify potential future vulnerabilities that have not yet been reported officially as CVEs. It can be rapidly deployed for SCA across all applications and provides a control tower view of all the applications, thereby instilling a process that doesn't solely depend on each individual developer's vigilance. CAST Highlight provides actionable insights across the application portfolio and enables developers to make more informed decisions and drill down to individual applications as needed. It provides built-in custom survey functionality, allowing organizations to capture qualitative information about applications and make more informed decisions with a stronger business context.

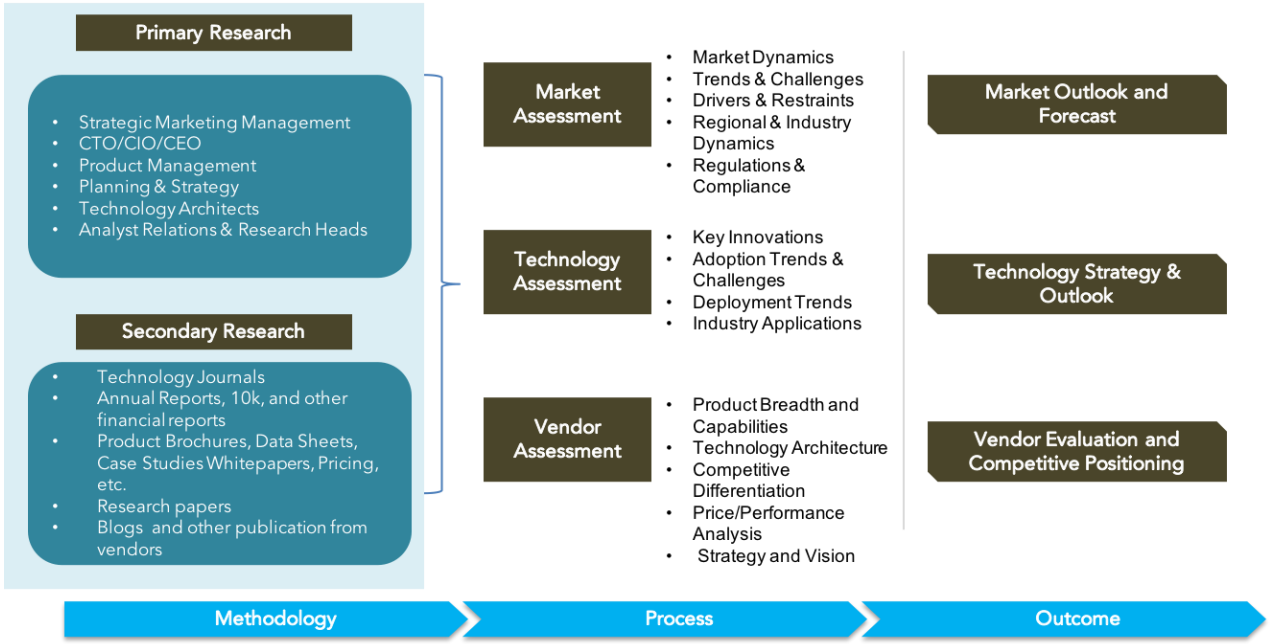
- The company holds a strong customer base across industry verticals such as banking, financial services & insurance, government & public sector, energy & utilities, logistics & transportation, electronics & semi-conductor, automotive, manufacturing, CPG & retail, healthcare & life sciences, and education, as well as amongst system integrators and advisories. The company holds a commanding presence in North America, followed by Europe. The company also has a presence in APAC and Latin America. It caters to a variety of use cases, including OSS security vulnerability risk management, OSS IP and licensing risk management, OSS technology obsolescence management, automation of cloud

migration planning, application portfolio management, application portfolio rationalization, and technology due diligence for M&A.

- The primary challenges of CAST include the growing competition in the SCA market from emerging vendors with innovative technology offerings. They are targeting all sizes of organizations to gain a strong market position. However, with its comprehensive technology, portfolio 'control tower' approach, innovative offerings, and effective competitive and growth strategies, CAST is well-positioned to grow its share in the global SCA market while targeting enterprises.
- The major highlights of CAST Highlight's product roadmaps include the addition of the BOM Manager for more flexibility and customization on the BOM for individual applications. The company will add a component replacement recommender to provide automated recommendations on safer components that can be incorporated into the code. It plans to enable OSS License compatibility reporting in CAST Highlight and offer green IT or sustainability insights as a feature on the platform.

Research Methodologies

Quadrant Knowledge Solutions uses a comprehensive approach to conduct global market outlook research for various technologies. Quadrant's research approach provides our analysts with the most effective framework to identify market and technology trends and helps in formulating meaningful growth strategies for our clients. All the sections of our research report are prepared with a considerable amount of time and thought process before moving on to the next step. Following is the brief description of the major sections of our research methodologies.



Secondary Research

Following are the major sources of information for conducting secondary research:

Quadrant's Internal Database

Quadrant Knowledge Solutions maintains a proprietary database in several technology marketplaces. This database provides our analyst with an adequate foundation to kick-start the research project. This database includes information from the following sources:

- Annual reports and other financial reports
- Industry participant lists

- Published secondary data on companies and their products
- Database of market sizes and forecast data for different market segments
- Major market and technology trends

Literature Research

Quadrant Knowledge Solutions leverages on several magazine subscriptions and other publications that cover a wide range of subjects related to technology research. We also use the extensive library of directories and Journals on various technology domains. Our analysts use blog posts, whitepapers, case studies, and other literature published by major technology vendors, online experts, and industry news publications.

Inputs from Industry Participants

Quadrant analysts collect relevant documents such as whitepaper, brochures, case studies, price lists, datasheet, and other reports from all major industry participants.

Primary Research

Quadrant analysts use a two-step process for conducting primary research that helps us in capturing meaningful and most accurate market information. Below is the two-step process of our primary research:

Market Estimation: Based on the top-down and bottom-up approach, our analyst analyses all industry participants to estimate their business in the technology market for various market segments. We also seek information and verification of client business performance as part of our primary research interviews or through a detailed market questionnaire. The Quadrant research team conducts a detailed analysis of the comments and inputs provided by the industry participants.

Client Interview: Quadrant analyst team conducts a detailed telephonic interview of all major industry participants to get their perspectives of the current and future market dynamics. Our analyst also gets their first-hand experience with the vendor's product demo to understand their technology capabilities, user experience, product features, and other aspects. Based on the requirements, Quadrant analysts interview with more than one person from each of the market participants to verify the accuracy of the information provided. We typically engage with client personnel in one of the following functions:

- Strategic Marketing Management
- Product Management
- Product Planning
- Planning & Strategy

Feedback from Channel Partners and End Users

Quadrant research team researches with various sales channel partners, including distributors, system integrators, and consultants to understand the detailed perspective of the market. Our analysts also get feedback from end-users from multiple industries and geographical regions to understand key issues, technology trends, and supplier capabilities in the technology market.

Data Analysis: Market Forecast & Competition Analysis

Quadrant's analysts' team gathers all the necessary information from secondary research and primary research to a computer database. These databases are then analyzed, verified, and cross-tabulated in numerous ways to get the right picture of the overall market and its segments. After analyzing all the market data, industry trends, market trends, technology trends, and key issues, we prepare preliminary market forecasts. This preliminary market forecast is tested against several market scenarios, economic most accurate forecast scenario for the overall market and its segments.

In addition to market forecasts, our team conducts a detailed review of industry participants to prepare competitive landscape and market positioning analysis for the overall market as well as for various market segments.

SPARK Matrix:
Strategic Performance Assessment and Ranking

Quadrant Knowledge Solutions' SPARK Matrix provides a snapshot of the market positioning of the key market participants. SPARK Matrix representation provides a visual representation of market participants and provides strategic insights on how each supplier ranks in comparison to their competitors, concerning various performance parameters based on the category of technology excellence and customer impact.

Final Report Preparation

After finalization of market analysis and forecasts, our analyst prepares necessary graphs, charts, and table to get further insights and preparation of the final research report. Our final research report includes information including market forecast; competitive analysis; major market & technology trends; market drivers; vendor profiles, and such others.