

Low-code development platforms (Landscape report)

1. What is a low-code development platform?

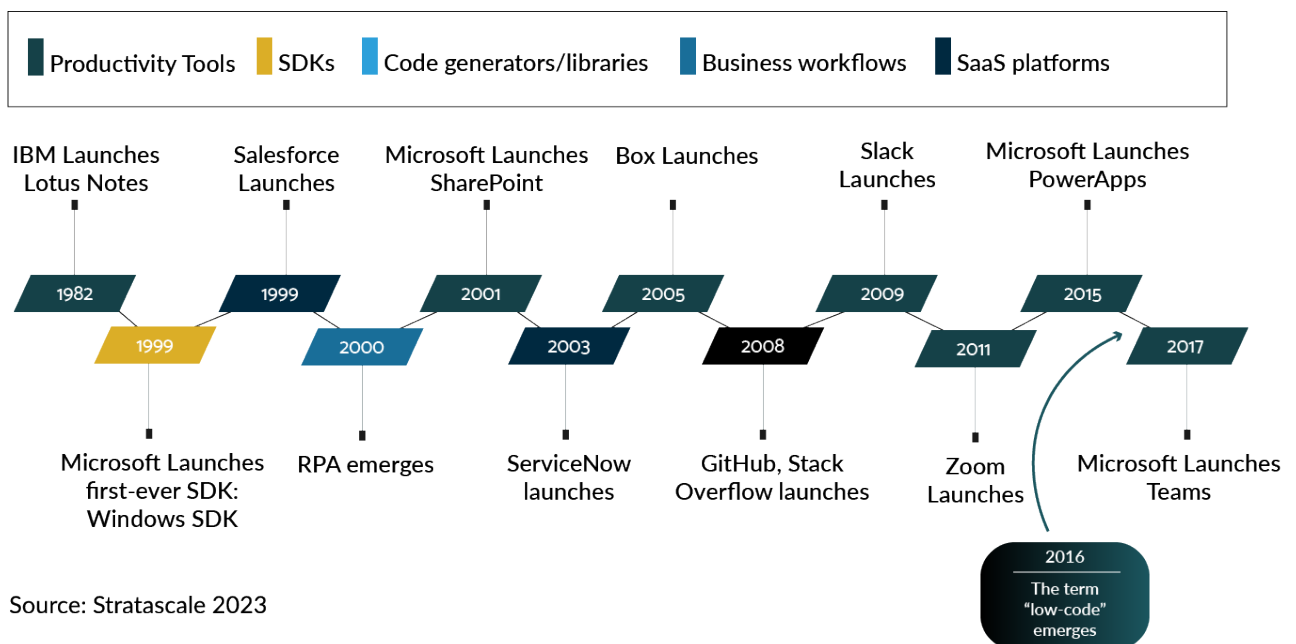
Low-code development platforms are software development tools that allow users to build applications using visual, template-driven interfaces. Low-code platforms present key application development concepts at a higher level of abstraction, so users require little to no knowledge of traditional programming languages. The combination of drag-and-drop for common concepts with a way to “open up the code” and make “out-of-the-box” adjustments or connect to more complicated functionality makes them a desirable option in the broader digital business landscape.

2. Application development platforms

a. Background

Stratascale views low-code development platforms as existing within a broader ecosystem of productivity tools and platforms, all of which are aimed at making it easier for a wider range of people to deliver digital business capabilities for themselves, their departments, and their enterprises.

- Allowing knowledge workers to increase their own **personal and team productivity** started with tools like Lotus Notes and Sharepoint, and it continues today within “office” and “document” platforms like Teams, Slack, and Box.
- Modern **software-as-a-service platforms are highly configurable**: You can create business value by leveraging low-code capabilities in ServiceNow and Salesforce, such as configuring custom screens and data tables. It’s worth noting that SaaS platforms often act like platforms as a service (PaaS) in that you are writing custom code and integrations, and they often require a dedicated team of developers or administrators to support them.
- Tools specializing in **business workflows** have been around for a while, with the new “spin” of supporting highly automated workflows (“BPA” and “RPA”).
- **Code generators and code libraries** enable software developers to focus on novel business functionality by helping them reuse “the basics” over and over again.
- **Software development kits (SDKs)** enable software developers to program an application by providing them access to a variety of tools in one package.



Source: Stratascale 2023

	No-code	Low-code	Pro-code
Users	Knowledge Workers	Junior Developers	Experienced Developers
Use cases	Team Productivity	Departmental apps	Enterprise capability
Workflows	Simple	Sequential and standardized	Innovative processes
Integrations	Simple	Standard API	Innovative consolidations
Customizability	Constrained	Unique configurations	Customization and extensions

Degree of coding required

Source: Stratascale 2023

b. Types of development platforms

Development platforms fall on a spectrum based on the level of programming expertise they require of their users. Stratascale has grouped these platforms into ‘no-code’, ‘low-code’, and ‘pro-code’. All these development platforms share a common goal: to improve the ability to create custom business functionality in support of digital transformation and increased digital agility.

	No-Code	Low-Code	Pro-Code
Accelerators	No Code Platforms	Low Code Platforms	Code generators, SDKs, and libraries
Typical use case	Knowledge workers improve productivity for themselves and their immediate teammates	Junior developers create internal applications for business units	Professional developers compose enterprise-wide systems that create a business advantage
Scope of app	Personal & Team	Departmental	Enterprise
Business workflows	Best suited for simple workflows	Ideal for sequential and standardized workflows	Best suited for proprietary workflows
Integrations	Simple integrations possible	Standard API integrations can be done	Proprietary integrations require pro-code
Customizability	Constrained	Unique configurations	Customization and extensions

Enterprises should look to the particular use cases to determine which kind of platform is most appropriate. They should also look to standardize around as few development platforms as possible so as to maximize efficiency and reduce complexity.

In this report, we will separate some of the hype from the value and help you plan low-code rapid application development as part of your digital agility roadmap.

3. Why are low-code application development platforms important?

Low-code platforms can help increase speed, improve efficiency, lead to higher quality, and reduce risk. To address various business challenges, vendors are positioning themselves differently in the marketplace. Here are criteria that help you evaluate your options.

Business Drivers	Business Challenges Why enterprises are considering low-code application platforms	Market Trend What the vendors are doing to grow market share and/or differentiate	Evaluation Criteria What to look at to help you pick a low-code application platform
Digital Agility	Talent shortages	Easier-to-build apps	Platform skill requirements vs. current staff abilities
Change Management	Scalability and maintainability	Professional best practices	Existing best practices
Customer Experience	Quicker development	Customizability	Quality of UI for end users
Integration	Connecting disparate technologies	Building an ecosystem	The ecosystem vs. platform features

Digital agility: The current talent shortage is overloading existing software developers' plates, and many organizations are forced to get by with fewer developers. In some use cases, low-code platforms can ameliorate this [talent shortage problem](#) by making it easier and more efficient to build apps. When looking for a low-code platform, map skill requirements to your current staff abilities.

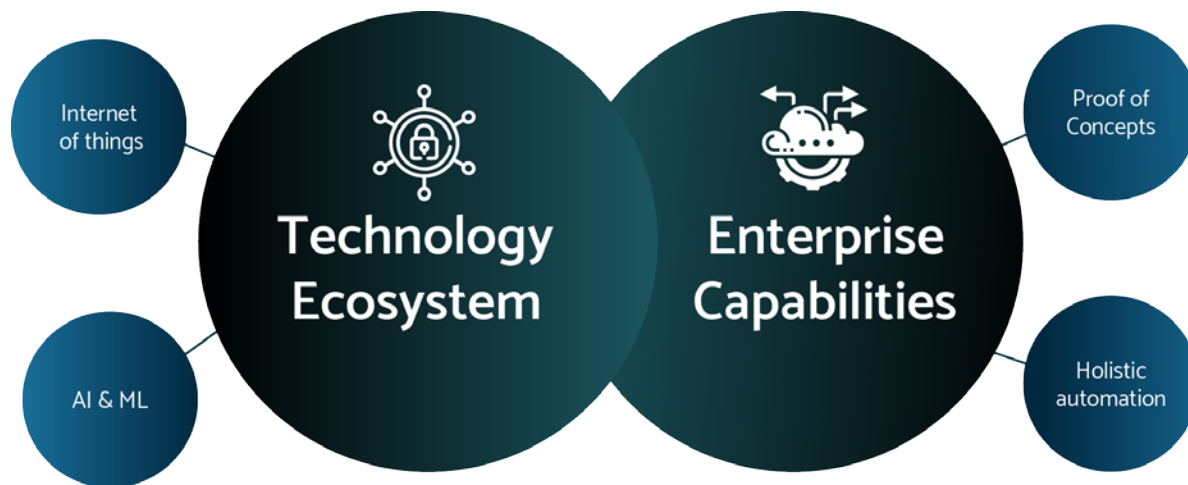
Change management: Applications need to scale across the enterprise and be easy to maintain. Platforms often come with professional best practices baked in. Decision makers who are evaluating low-code platforms' change management capabilities may want to begin by examining their existing software development best practices and considering or planning their desired future state.

Customer experience: Organizations face the challenge of accelerating the development of applications for customer use (not just for internal employee use). Customer-facing applications call for customizable design and styling to support your branding and user experience strategies. When evaluating low-code platforms in the customer experience space, organizations should place high value on the quality of user interfaces created by the platform.

Integration: Many other technology pieces (other systems, legacy apps, data silos, etc.) must fit in the bigger digital business puzzle for enterprises. Organizations need to consider the larger ecosystem around their low-code platform — therefore, their platform choice might be dictated more by the ecosystem that it is a part of (such as ServiceNow or Microsoft) than its features.

4. What are the drivers for low-code applications?

Low-code tools allow enterprises to take advantage of advanced technologies like machine learning and Internet of Things, which would otherwise be out of reach or require large, dedicated development teams.



Source: Stratascale 2023

a. IoT systems

Internet of Things, commonly referred to as IoT, refers to traditionally “dumb” devices (such as kitchen appliances) that now have compute and network connectivity.

IoT allows organizations to connect and harness data from several sources to make actionable insights for their business. McKinsey [predicts](#) that by 2030, IoT “could enable \$5.5 trillion to \$12.6 trillion in value globally.” Low-code platforms will undoubtedly play an integral role in the future of IoT, as they enable the rapid development of IoT software and applications.

IoT development is typically a complex process because it incorporates inputs from several different, unrelated sources. Low-code enables the quick connection and analysis of IoT data.

b. ML and AI enhancements

The inclusion of machine learning (ML) and artificial intelligence (AI) features in low-code platforms can assist in generating code, optimizing workflows, and integrating data. Some low-code platforms operate smarter by integrating ML model configurations that make suggestions as developers build applications, and by automating the integration of an AI model into an application.

c. PoCs

Low-code platforms can also be used to create proof of concepts (PoCs) without pouring too many resources into their development. After demonstrating the prototype’s business value, developers can then create a fully customized application with traditional coding methods.

d. Holistic automation

Robotic Process Automation (RPA), Business Process Automation (BPA), API orchestration, AI and ML, and customer software development are all associated with the buzzword “hyperautomation.” The term *holistic automation* encompasses the integration of these technologies. Organizations would benefit from including low-code platforms in a larger holistic automation strategy.

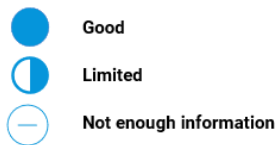
5. Sample vendor comparison

In the chart below, we present a variety of categories, encompassing different attributes of low-code platforms. We encourage readers to consult the chart for help narrowing down vendor options for further exploration.

The first factor to consider when looking at vendors is the longevity and support of the platform. You should be thinking about the vendor’s financial position and their commitment to the platform, because your business applications will be directly relying on the existence of the platform you build them in.



	Ease of Development	User Interface	Ecosystem	Advanced Tech	Platform Scalability
mendix	●	●	⊖	●	●
PowerApps	◐	●	●	◐	●
appian	●	●	⊖	●	●
PEGA	●	◐	◐	●	●
tray.io	◐	◐	⊖	◐	●



Source: Stratascale 2023

We ranked each vendor by the following categories:

- a. Ease of development: good documentation, secure by design, pre-built templates, and easy to test.
- b. User interface: intuitive to navigate and straightforward processes.
- c. Ecosystem: the platform is part of a larger family of products.
- d. Advanced technology: supports leveraging emerging technology (such as AI, ML, and IoT) within your applications.
- e. Platform scalability: the ability of the platform to integrate with external services.

6. Vendor Appendix

Mendix

Overview: “We founded Mendix to solve our personal frustration with the complexity of custom software development, which is siloed, slow and consistently fails to deliver intended business results. We believed deeply we had to fundamentally reimagine and elevate the traditional roles played by Business and IT teams in the app development process. In a world hyper-obsessed with inputs and processes, we wanted to create a new way so teams could rapidly and continuously translate their ideas into real business value. So we created an app platform that allows your whole organization to participate and collaborate in the application development process, enabling you to unleash your best ideas quickly with software.”

Funding: \$38 million

Capabilities:

All-in-one Low-code Platform

Create better software faster by abstracting and automating the development process with Mendix, the all-in-one low-code platform.

- **App Development:** Empower co-creation across a diverse developer spectrum with a common visual language and dedicated IDEs to meet business needs quickly and efficiently.
- **Cloud:** Build and deliver portable, scalable, and resilient applications without specialized expertise. Deploy anywhere in one click.
- **Multi-experience:** Visually design, context aware smart applications, that deliver exceptional users experiences across a range of touchpoints and modalities.
- **Artificial Intelligence:** Embrace smart applications; seamlessly connect AI and cognitive services to elevate your solution.
- **Intelligent Automation:** Deliver end-to-end process automation with applications that bring people, data, and systems together.
- **Data Integration:** Open and extensible at every level: platform, models and applications. Integrate data and logic from any data source, system or service.

Microsoft PowerApps

Overview: PowerApps empowers both citizen developers in the business, that feel at home visually wiring applications together, as well as professional developers that are eager to jump into writing code. Microsoft Flow automates workflows between apps and services to manage approvals, synchronize files, collect data, and more. The Common Data Service an enterprise-grade data platform built into the Power Platform that includes rich business logic, security models, and developer extensibility. In addition, Power BI provides robust business analytics and data visualization.

Funding: Not applicable.

Capabilities: Microsoft [defines PowerApps](#) as a “low-code tool with helpful prebuilt templates and drag-and-drop tools.” It’s a part of their Power Platform, which combines low-code app development, workflow automation, AI bot development, and data analytics. It’s also natively compatible with Microsoft Azure, Office 365, and Dynamics 365. Many organizations already pay for this and therefore don’t need to spend an extra dime to build quality low-code applications for their enterprise.

Enterprise IT platform

Appian

Overview: Appian is a low-code automation platform for building enterprise software applications, faster. They help you automate and transform your business by creating new apps from scratch, or by connecting and enhancing legacy applications – all up to 20X faster than traditional development. With Appian, you get the speed of low-code development with the power of intelligent automation in one trusted and unified cloud platform.

Funding: \$10 million

Capabilities:

Full-stack automation. A fully unified platform delivering the right technology for the right job. Only Appian natively unites all the capabilities required to deliver impactful, end-to-end processes across your organization. Now you can build more powerful apps and dramatically increase productivity.

- Robotic Process Automation (RPA) – Automate routine tasks in a workflow and integrate systems without APIs.
- Business Process Management – Design, execute, manage, and optimize complex processes with industry-leading iBPM.
- Case Management – Automate collaborative work and exception handling with best-in-class capabilities.
- Artificial Intelligence – Make your applications work harder and smarter with integrated AI from Google, AWS, and Azure.
- Decision Rules – Quickly define simple to complex business logic and execute it automatically.

Data anywhere. Unify your data into a single interface with zero-code integrations—not migrations. Get the flexibility you need to bring data together from across your organization into a single interface, so action can be taken when and where it’s needed. You control your data. No migration, no lock-ins, and no transaction or storage fees.

- Easily integrate with enterprise systems such as Salesforce, SAP, Oracle, DocuSign, Blue Prism, and more.
- Integrate systems with zero-code, low-code, and industry standard connectors or build your own with custom APIs.
- Remove data silos and orchestrate your data to create a more seamless experience for your users.

- Use Appian RPA in a workflow to integrate systems without APIs and leverage your IT investments.

Low-code. Develop and deploy up to 20x faster. Drive innovation at unprecedented speeds. We don't just say it, we guarantee it. Design apps with a mouse click, using reusable components to build quickly. Our apps run even the most mission-critical and complex processes.

- **Visual Design:** Drag-and-drop and point-and-click tools deliver apps incredibly fast, allowing for easy iteration.
- **Process Models:** Draw business processes instead of coding them, dramatically improving collaboration between IT and business.
- **Reusable components:** Build each successive app faster, leveraging reusable components from other apps.
- **Prebuilt UIs:** Leverage or enhance existing UIs to delight your end-users.
- **Automatically Mobile:** No more designing for mobile, web, Mac, PC, iOS and Android separately. Design it once and it works natively on all devices.
- **Future Proof:** Applications built are automatically upgraded to ensure compatibility with future operating systems, browsers, mobile devices, and UI technologies.

Pega

Overview: The Pega low-code factory approach allows anyone to develop enterprise apps. Business users, developers, and IT are able to collaborate, innovate, and deliver critical applications from one inclusive environment – so organizations can build apps faster and smarter.

Funding: Not applicable

Capabilities:

Build quickly: Achieve incredible value fast.

- **Low-code app development:** Respond to business needs in real time with Pega's collaborative low-code approach. Start fast, then scale with comprehensive management capabilities.
- **Case management:** Get work done by combining the decision-making capabilities of business rules and AI with the power of automation and robotics.

Business benefits:

- Reduce manual processing
- Power collaboration between business users, developers, and IT
- Get to outcomes faster

Automate intelligently: Bridge gaps and transform processes.

- **Robotic Process Automation (RPA):** Automate legacy systems and bridge last-mile gaps across your enterprise. Scale quickly and evolve as your needs change.

- **Business Rules & AI:** Improve employee productivity and deliver rapid, personalized service to your customers.

Business benefits:

- Automatically process thousands of incoming emails with natural language processing.
- Improve average handle time and first call resolution.
- Integrate legacy systems, even if APIs don't exist.

Scale with confidence: Stay in control of your future.

- **Center-out business architecture:** Our built-in approach centralizes business logic, so you can respond to customer needs and scale fast.
- **Pega Process Fabric™:** Improve the employee experience and get more done by weaving together disparate business applications.
- **Multi-experience applications:** Quickly create beautifully designed web, mobile, and chat experiences with an open front-end architecture that gives you full control.

Business benefits:

- Deliver a consistent experience across all channels.
- Orchestrate work across applications.
- Pull important data from existing systems without adding complexity.

RPA

Key features of Pega Robotic Process Automation:

- **Use desktop mining to automate strategically:** Strategic automation starts with the right data. Pega Workforce Intelligence™ uses AI to identify where and when to automate for maximum impact.
- **Bots that offer optimization and path to digital transformation:** Legacy systems and old user interfaces are not suited to transformation. Our unattended RPA bots are a breakthrough to smash through these walls.
- **Maximize your digital workforce:** Collaboration across your digital workforce is easier than ever. Pega Robot Manager is designed to make sure humans and bots work in unison with all your processes, new and old.
- **Automate email triage:** High email volume leading to slow responses? Pega Email Bot™ uses natural language processing (NLP) and AI to automatically triage and route and respond to emails, speeding time to resolution with accuracy.
- **AI for self-healing automations:** It takes a lot of upfront work to make RPA succeed. And when applications change, the automations break and leave you at square one. X-ray Vision reduces upfront effort, using AI to self-heal automations as applications change.
- **Use desktop mining to automate strategically:** Strategic automation starts with the right data. Pega Workforce Intelligence™ uses AI to identify where and when to automate for maximum impact.

Case Management

Award-winning case management and BPM for continuous operational excellence.

- **Orchestrate work from end-to-end with case management:** Customers demand flawless experiences and outcomes. Pega digital process automation with case management gets you there. Orchestrate work, automate with bots, make smart decisions with rules and AI and deliver channel-less experiences.
- **Not just automate, optimize your business process with Pega BPM:** Pega BPM streamlines operations to reduce costs and improve business agility. Analysts recognize Pega as the most comprehensive BPM suite to combine RPA and BPM in a single, unified platform.
- **Manage cases seamlessly across channels:** Pega enables business stakeholders to accelerate enterprise app development through visual tools (no coding), support for business/IT collaboration, and continuous improvement by allowing user modifications to running apps in a controlled way.
- **Provide visibility across business silos:** As work passes from one business silo to the next, Pega preserves the context of each piece of work throughout the entire work lifecycle. This helps large organizations integrate, automate, and improve their complex front- and back-office business operations.

Additional Product Features:

- **Pega Robotic Process Automation (RPA):** A core capability within Pega's industry leading BPM platform, Pega RPA allows enterprises the flexibility to optimize how work gets done in the enterprise by orchestrating workflows, done by humans or robots, from a central platform.
- **Pega – DocuSign Integration:** Pegasystems and DocuSign have announced a technology partnership enabling enterprises to integrate DocuSign's digital signature capabilities within Pega's CRM applications and the Pega Platform.

Tray.io

Overview: Tray.io provides a cloud-based software integration platform for automators. Tray.io believes that any organization can and should automate. With the Tray Platform, citizen automators throughout organizations can easily automate complex processes through a powerful, flexible platform, and can connect their entire cloud stack thanks to APIs.

Funding: \$95.57 million

Capabilities:

Flexible:

Gain flexibility to make anything possible: Like snowflakes, no two processes are alike. They deserve the flexibility of the Tray Platform, which lets you configure the most complex workflows, integrate any application, and add customized logic for strategic competitive advantage.

Make a deep connection with any web service:

- **Connect to any SaaS app with our universal connector:** If your app has a RESTful API (and most do), we can connect to it.

- **Full API access - including custom fields:** Find every last bit of data, including custom fields. Leave no data behind.
- **Connect wickedly fast with pre-built connectors:** Sync to any Cloud app on our growing list of connectors.
- **Don't interrupt! Flow well with connector versioning:** Prevent a lapse if an API ever changes with the Tray Platform's unique approach.

What's your first move? Authenticate securely, quickly:

- **Authenticate any API:** Credentials, Tokens, OAuth. No problem.
- **Control permission scopes:** Manage access to certain parts of your apps' API with check boxes.
- **Take a shortcut with the Tray Platform's API credential keychain:** Manage access to all of your cloud apps in a central space.
- **One tool: multiple authentications:** Access several accounts for the same tool or for sandbox and production.
- **Multiple authentications per workflow:** Build complex workflows that access multiple accounts.

Powerful:

Powerful enough for enterprise: The Tray Platform gives power users the flexibility to integrate apps and automate processes using preferred languages and tools.

Re-invent processes with flexible logical operators:

- **Error Handling:** Manage errors before they happen at every step of your workflows.
- **Boolean Condition:** Use powerful "if/then" logic and run part of your workflow only some of the time.
- **Branch:** Compare a single value against multiple different options and follow the match.
- **Loop Connection:** Extract fundamental key data points out of arrays or objects.
- **CSV Editor:** Easily manipulate data sets on the fly with in-memory processing.
- **Script:** Write custom code and execute a block of JavaScript code synchronously or asynchronously.
- **CSV Reader:** Rapidly query, process, and extract from massive flat files in seconds.
- **Data Storage:** Store data for recall between steps.
- **HTTP Client:** Make a REST-based request to a specified URL.
- **Call Workflow:** Break up large workflows, pass data between workflows, and reuse one workflow in multiple workflows.
- **Delay:** Set a time delay on an event to begin when you need it.
- **Mustache Template:** Use the template connector to pass data through a mustache template.
- **FTP Client:** Download a file or list all files in a directory on both FTP and SFTP servers.
- **Send Mail:** Use a workflow to send emails to yourself or anyone else.
- **Break Loop:** Use with our Loop Connector to customize loops in your workflows.
- **Trigger Event Reply:** Get an immediate response from a webhook and process the data.
- **XML Decoder:** Transform XML into JSON – automatically.
- **Terminate:** Test your workflows one step at a time.

Dev friendly capabilities:

- **Rollback History:** Quickly see every change to your workflow - and instantly revert back with one click

- **Database connectors:** Connect Postgres, AWS S3, Base, Firebase, MySQL, Redshift, etc.
- **On-Premise Connectivity:** Build workflows to connect apps in your data center with your cloud apps.
- **SSO for the Enterprise:** Securely log-in to the Tray Platform with SAML SSO.
- **Real-time logs:** Run logs in real-time to spot small issues quickly.
- **Advanced debugging of logs:** Search and filter logs on any property for fast debugging.
- **Customizable log retention:** Customer defined log retention time to comply with your security policies.
- **Map data between historical steps:** Use the data from any previous workflow step later in your workflow.
- **List handling:** Lists at higher scale, including pagination, and volume.

Scalable:

Scalable for mission-critical processes: Never outgrow the Tray Platform. Build on an enterprise-ready platform and never incur switching costs.

The Tray Platform is built to scale:

- **Infinite scalability:** Scale up or down for an unlimited number of workflow tasks.
- **Data storage:** When building workflows, it is helpful to store data temporarily.
- **Real-time workflow processing:** Never a delay in the scheduled start time of the workflow or its execution.
- **Log data storage:** We store log data for you to inspect workflows that executed in the past.
- **Alerting:** Know when a workflow process fails; customize how alerts are triggered.
- **Trust:** See our Trust page for full details of security measures.
- **Roles-based access controls:** Full control of user access and permissions.