



End-to-End AIOps

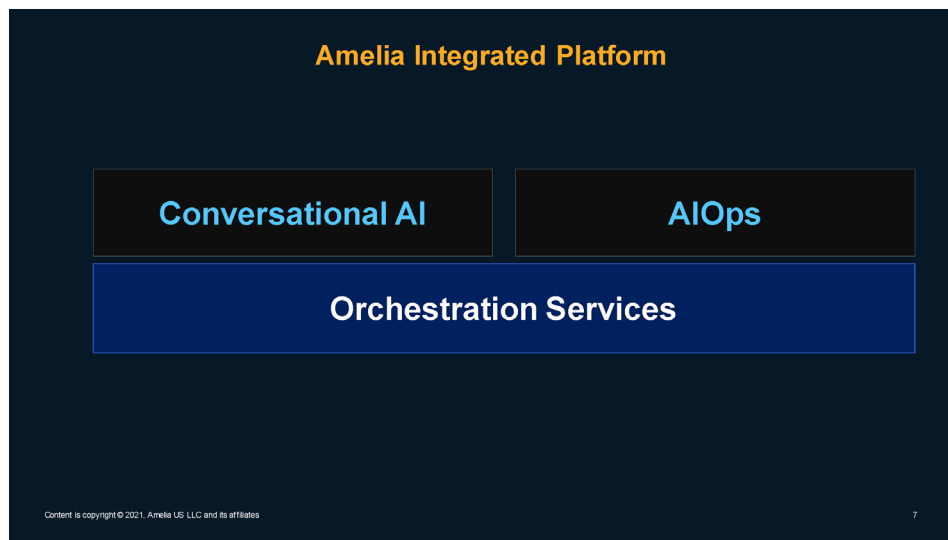
Creating Business Value with
End-to-End Intelligent Automation

AMELIA®

The Amelia Integrated Platform

The Amelia Integrated Platform is the leading Conversational AI platform with built-in Business Process Orchestration. The platform consists of two primary solutions — **Amelia Conversational AI** and **Amelia AIOps** — enabled by a common set of Orchestration Services. Taken together, the platform is purpose-built to help companies in any industry accelerate their journeys toward a friction-less digital enterprise.

While there are a vast number of potential use cases that could be enabled by this platform, some of the most powerful center on the ability to bring even greater efficiencies and optimizations within corporate IT departments, which we'll explore in detail in this paper. However, keep in mind that success with the Amelia AIOps Platform requires a fundamental change in attitude, mindset, skills, organization, etc., and bringing about those changes requires a level of commitment from company leaders.



This paper focuses on **Amelia AIOps**, its capabilities and the value that it can deliver to an enterprise. AIOps is an ITIL-compliant solution that comes with analytics, event correlation, root case analysis, anomaly detection and other innovative features. Out-of-the-box, the platform is ready to automate IT processes and resolve employee requests from its first day of deployment. The platform learns from user interactions and human inputs to recommend new automations.



IT Service Desk Concierge

Amelia will service employees IT needs over voice, chat or email.



Experienced IT Colleague

Amelia will assist your entire IT team with tasks through advanced chat-ops and integrations.



Complete ITSM System

From incident, problem and change management with CMDB and discovery functions.



IT Monitoring System

Monitoring network, system applications etc. with advanced event correlation and anomaly detection.



IT Process Automation

Building intelligent virtual engineers that can diagnose and resolve infrastructure issues.



Collaboration System

Providing intelligent recommendations and proposed next steps for human resolution.



Integration Flexibility

Connecting seamlessly to other systems in the IT management ecosystem for automation and data access.



Automation Library

An extensive and growing compilation of end-to-end diagnostics and remediations for resolving common issues.



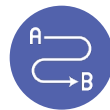
Modern and Scalable Platform

Built upon containers and Kubernetes for resiliency and dynamic scalability.



Low-code Principles

Designed for the citizen developer to easily create automations and conversational flows.



End-to-end Learning

Activities that still require human intervention are observed and can be used for new automations.



Security and Privacy

Multi-tenant, encryption, secure password vault, GDPR compliant.



Improvement Analytics

Everything is observed and can be used to continuously improve the performance of the system.

A Solution Centered on Automation, Learning, Self-Improvement

Amelia AIOps is an integrated system designed for end-to-end (e2e) automation and learning.

AIOps works in concert with foundational Orchestration Services, which provides a built-in integration system, a credential management system and many other functions. The overall goal of Amelia AIOps is to fully automate tedious tasks and manual activities previously carried out by human staff – so they can concentrate on higher-value tasks and/or continue performing their jobs with limited interruptions due to technical issues or other hurdles.

When it comes to dealing with IT service or support issues, requests can be initiated from multiple sources – from users, alerts and monitoring systems, change requests from new versions of applications, etc. – and dealing with those tasks can be prioritized and scheduled by different systems. Much of the work performed in IT comes via user requests or reported incidents, i.e. tickets. These can be created through different channels such as email, phone, chat, Service Catalogs or portals. Some of the channels like Service Catalogs can produce well-structured requests, however most of these channels deal with unstructured requests.

With AIOps working with Orchestration Services, Amelia becomes the normalizer of all this unstructured input. Whether users email, chat or speak directly with Amelia to get their issues or requests resolved, she will correspond in real-time for resolutions. Amelia does this through Natural Language Understanding (NLU), where she extracts the intent and required information through natural dialog while adhering to business processes to perform the work.



Amelia also deals with incoming structured or semi-structured requests where a user's intent and all or some of the required information is programmatically presented from the beginning – but additional steps are required and usually handled by a service desk agent. These requests could originate from a catalog or self-service portal, such as password resets, account activations, troubleshooting email or ordering new phone headsets.

In addition, work can originate directly from Amelia herself: She could be prompted by a process or schedule to perform activities with users, i.e., detecting that an account has been locked due to password expiration, or that a new employee needs onboarding. Amelia in turn can reach out through any channel to complete the task for the employee.

Observability



Timely and granular event and data monitoring is essential for any IT management system to function properly and effectively. The type of monitoring input can range from system, application, database, storage and network performance, various entries from systems logs, and response times from various applications, APIs or cloud services. The advent of technologies such as SaaS, cloud and containerization, and methodologies such as Dev/Ops and Infrastructure as Code (IaC), continues to change the landscape of monitoring requirements, and if anything increases the need for monitoring data.

With Amelia AIOps, customers can continue to use their existing monitoring systems as the platform's built-in Orchestration Services can consume all the events, alerts, logs and performance data from third-party systems (Spectrum, Splunk for IT Operations or Microsoft SCOM, for example). Most of the common monitoring systems have standard integrations available and adding new integrations points can be done fairly easily using templates.

The solution also includes its own modules for monitoring the IT environment including:

- A scalable monitoring infrastructure which can monitor availability and performance of networks, systems, applications, databases, storage and cloud infrastructures. The health checks and policies are created in an easy-to-use UI called IPadmin, which also allows for import and export of monitoring checks from other environments.
- A scalable log monitoring system for any type of log, including system and application logs. Logs are analyzed and can be searched according to incident type and other factors.

All the various forms of input which enter AIOps need to be categorized, filtered and correlated so the system can determine what to do with the information. The basic question AIOps is trying to answer is whether something requires further examination and further action, and in what time context.

Once all information is correlated and analyzed, regardless of input, AIOps can determine what remediation steps can be taken. The next steps in the process all utilize AI and machine learning to improve and speed up the work required for the resolution of issues, whether that work is done automatically by Amelia without human involvement or incorporating human assistance.

First is anomaly detection. Today's IT environments are incredibly dynamic and complex, and while traditional paradigms using thresholds-based monitoring are still important, they are inefficient and cumbersome to maintain. Sometimes server utilization of 99% is perfectly fine and 45% utilization would be a warning sign or vice versa — depending on application, use within a company, etc. Our platform's anomaly detection module deals with such situations, using multiple algorithms and Dynamic Time Warping (DTW) to learn how anomalies are connected over time.

Once the system has determined that work needs to be performed based on the analysis done in the previous phases, AIOps uses machine learning to assign tags to non-event-based tasks. These tags will be used later in the process to move the work into the appropriate ITIL process automatically. Traditionally, tasks have been handled via basic rule-based systems or sometimes manually by IT staff, which slows down the process significantly. Machine learning-based tagging offers a faster and more efficient way and most importantly it improves over time.

Automated Diagnostics

To automatically resolve many tasks in IT environments, more information or validation needs to be collected before the system can make an informed decision. Amelia AIOps automatically decides

which diagnostics or validation tests to execute based on matching rules using tags created during the discovery process, and it documents any results in the tasks for subsequent automation or human action.

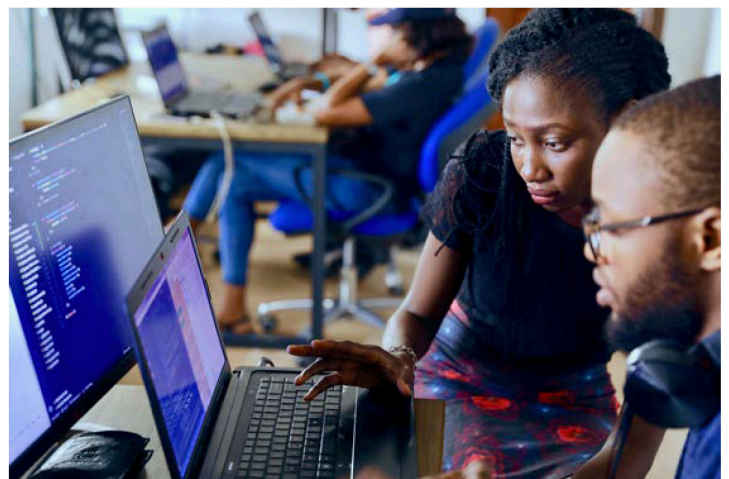
Building new diagnostics can be done using three different built-in technologies depending on the end-system being examined:

- **Orchestration Services** allows the platform to directly connect to systems using APIs and other methods to verify and extract information in a programmatic way. This is very useful with more modern cloud based applications and infrastructures. It is generally also the fastest and most reliable approach to gathering information.
- **IT Process** is generally used with systems offering command-line interfaces to obtain information and insight. It is easier to build more complex and intelligent diagnostics in this methods, and while it is slightly slower than direct API integrations, reliability is comparable.
- **Robotic Process Automation (formerly called 1RPA in our platform)** is used primarily where no programmatic interface is available or sufficient to execute the diagnostic test. RPA uses an application's UI (browser, Windows, Citrix, etc.) directly to perform actions and extract information. It can be used to mimic user access, performance and functionality in applications, i.e., synthetic testing to validate issues.

Some combination of these methods – including third-party diagnostic utilities – is sometimes required to build the right diagnostics test. Just like humans might use both command-line interfaces, third-party utilities and application UIs to gain insight into issues, automated diagnostics take advantage of those as well.

The diagnostics steps serve multiple purposes:

- They validate that there is in fact an issue that needs to be addressed. Intermittent issues come and go, and it is important to investigate and document the issues even if they no longer are present in the environment for problem management purposes.
- They determine the underlying issue, which can then be automatically remediated or escalated to the most appropriate engineer for manual remediation with pertinent information. However, at a minimum it prepares documentation and explores the “low-hanging-fruit” so the engineering team do not have to spend time on basic troubleshooting.

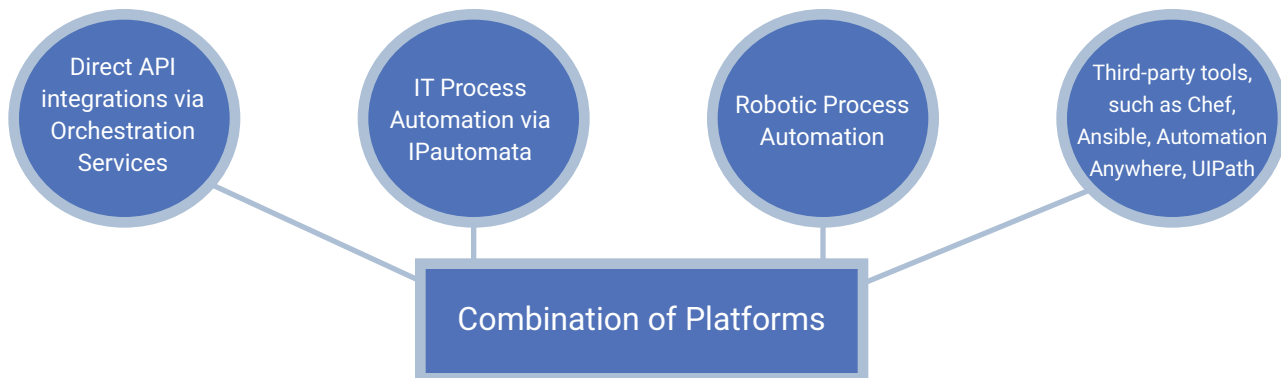


Automated Remediation

Once the diagnostic phase has validated the issues and potentially identified the underlying issue, additional matching rules are activated in Amelia AIOps to determine which automations should be executed to remediate the issue.

Diagnostics, matching rules and remediations are generally managed as a solution, i.e., it makes little sense to have remediations without an ability to detect (diagnostics) situations where the remediation should be executed. Some diagnostics will not always have direct matches to remediations as they serve as a first step in a manual (human) troubleshooting scenario.

Similar to diagnostics, the platform includes multiple technologies and methods to create new remediations in addition to the ones provided by our library:



With AIOps, enabled by Orchestration Services, we make an important distinction between simple automation scripts and intelligently written automations. Our best-practice automations are designed to withstand expected and unexpected changes in the environment, i.e., what happens if requests time out because of network congestion or tokens have expired?

Intelligent Dispatch

If automated remediation is not available or failed to resolve the underlying issue, the task will be assigned to a human engineer by the escalation services. Assigning the right engineer is based on algorithms where availability, current workload and importance of said workload, domain expertise and prior experiences in resolving similar issues are considered. The dispatch system learns over time as engineers resolve issues to improve the effectiveness of the system.



Once AIOps determines who should be assigned the task, Amelia will reach out to the individual to notify contextually that the issue has been assigned to them. There is no need to monitor queues, check emails or texts; engineers will simply receive contextual information and assignments live regarding their priorities. Amelia can reach out directly inside the platform chat interface or via Slack, Skype for Business, Cisco Jabber or other preferred chat systems.

The engineers can work with Amelia to reassign tasks if needed, either directly by suggesting individuals or by just asking her to assign the task to the next best choice. It provides engineers the flexibility to make decisions based on insight they have into their current workloads, i.e., they may be two hours into a change which still requires 20 minutes of work. Amelia can also overwrite these requests based on severity and priority of the task that she is assigning.

Human Resolution



When all automated resolution options have been exhausted and the task has been dispatched to a human engineer, Amelia AIOps provides multiple integrated facilities and tools to the engineer to assist with the manual resolution.

Chatting with Amelia

Engineers can instruct Amelia to perform various actions in context of the escalated issue. These actions can include restarting services, requesting one-time passwords, looking up SOPs (standard operating procedures), reassigning tasks, or setting up conference calls and inviting other engineers. In this capacity, Amelia becomes the “side-kick” for the individual engineers.

Documented Diagnostics and Failed Remediations

As previously mentioned, any diagnostics executed in context of the task are fully documented for the human engineer. This allows an engineer to quickly be brought up to speed and avoids time spent on doing this research themselves. In the case of matched remediations, results will also be fully documented for the engineer.

Suggested Diagnostics and Remediations

Amelia AIOps is a deterministic automation system, so only diagnostics and remediations that are matched will be executed automatically. However, the system will provide a probability score for automations that are likely to provide value or even resolve the issue so they can be executed by the engineer. Again, all results are fully documented.

Environment and Task Insight

Additional insight is available for an engineer working tasks, including:

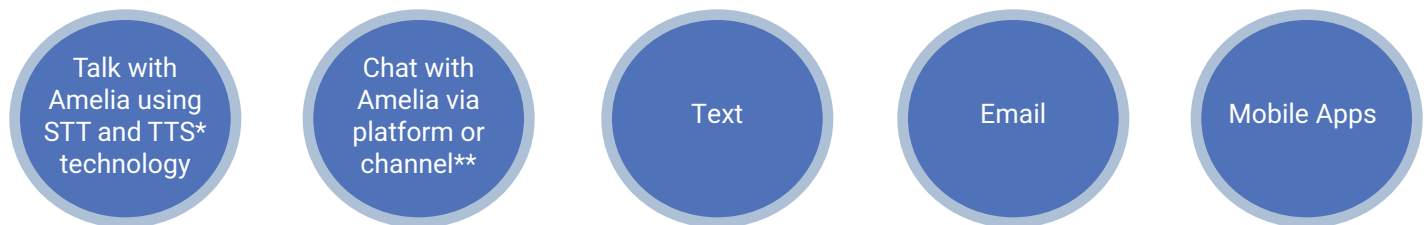
- **Task History.** Includes documented results from diagnostics and potential remediation, workflow state changes, and comments from other engineers who may have been working on the task beforehand.
- **Configuration Information.** Configuration, dependency and relationship information as well as tags provides valuable data when troubleshooting issues and problems.
- **Event History.** If the task was created via an event, has it occurred previously? Are there associated performance metrics available for the system reporting the event?
- **Workflow State.** Where in the ITIL process was the task when it got dispatched to the engineer? The different ITIL process flows quickly become second nature to engineers and understanding at which step the platform requested manual assistance can help remediate faster.
- **Standard Operating Procedures (SOPs).** SOPs and other relevant documents can be quickly surfaced through the platform’s built-in knowledge management solution IPkm. These documents are all organized via tags so relevant documents will appear dynamically.

Remote Resolution

Amelia AIOps directly connects the engineer to the remote system associated with the task. It utilizes the platform's user management system, or other third-party credential vaults or privileged user management solutions such as CyberArk, to securely connect and authenticate without requiring the engineer to enter credentials (as long as they are authorized to access the system.) This allows for a seamless transition within the platform interface to remotely execute commands to further diagnose or remediate the issue. AIOps automatically records and builds automations based on the actions of the engineer for later analysis.

Communicate Through Any Channel 24/7

When utilizing Amelia Conversational AI in tandem with Amelia AIOps, the Conversational AI competency allows employees to communicate through their preferred channels at any time:



* Speech to Text and Text to Speech

**Channel Integrations include Slack, Skype for Business, etc.

Amelia as a Virtual Colleague

Amelia can assist with simple and repetitive requests from employees. While there is tremendous value in doing that, the ultimate goal for Amelia within the platform is to be much more than a self-service chatbot for resetting passwords. Here are a few examples:

- **Multi-step resolution.** Many tasks solved by IT today are not single-interaction; they may require approvals, additional information or purchases and thus will require multiple interactions over hours, days or weeks. Chatbots today handle single interactions, so if some tasks require multiple steps they cannot resolve them. Amelia – through her CognitiveOS – maintains context and can therefore handle interruptions, and wait for other possible manual steps that have been performed, before re-engaging the employee to continue resolving the request.
- **Multiple simultaneous interactions.** Amelia is also able to hold multiple conversations with the same employee at the same time. Obviously, Amelia can also switch context in the same conversation, however if somebody requested a new phone yesterday and Amelia is awaiting the delivery of said phone before continuing that task, and now the same employee is having issues with Wi-Fi in the office – performing these tasks separately makes more sense.

—○ **Coordinating and collaborating.** Amelia AIOps becomes the central hub for requests, status updates and escalations. Even when Amelia is not working to resolve an employee's issue, she can look up who in IT is working on the issue, reach out via chat for updates not in the system to see if there is additional information required or when the issue is expected to be resolved.

Continuous Improvement

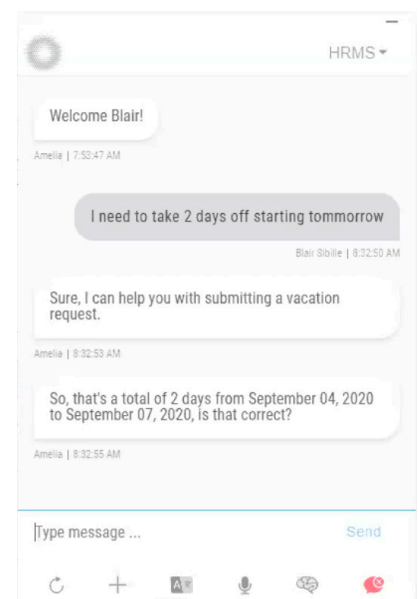
As stated previously, the goal of Amelia AIOps is to automate tasks which before required human steps. Generally speaking, it is always easy to identify the first processes which should be automated; those usually include account management (password resets, account maintenance, on-boarding/off-boarding, etc.) as well as system maintenance, provisioning, patch management, etc. However, once the low-hanging fruits are taken, how do you in Agile terms create the backlog of new automations. ITIL defines Continual Service Improvement (CSI) as an important process, and Amelia AIOps takes this to a new level of programmatic automation.

Amelia AIOps, working with Orchestration Services, uniquely combines front-office learning with back-office learning, and also automates analysis for improvements.

Front Office Learning

In Amelia AIOps, the front-office is staffed with Amelia and her human counterparts. When Amelia is unable to resolve a task for an end user or an IT employee, she endeavors to learn from how her human colleagues are resolving the issue. The learning falls in multiple categories:

- **Improvements in current capabilities.** When Amelia fails to recognize a request which she has been trained to resolve, she will analyze the subsequent dialog to extract information that can improve her understanding (context, intent and entities) as well as changes to her dialog flow (process). Some of these are simple thumbs up/thumbs down whereas others make use of advanced match and learn algorithms.
- **Identifying new tasks.** While this learning can take place outside of escalations by ingesting call transcripts, it is actively done during escalations. Amelia identifies new tasks by extracting intents, entities and process steps from the dialog performed by her human colleagues.
- **Reinforcement learning.** When Amelia is working as a whisper agent in the background assisting her human colleagues, she suggests actions (macros) and dialog based on her contextual understanding of the situation. When human agents select or ignore these suggestions, Amelia learns and improves her understanding of these situations.



Back Office Learning

When engineers are resolving issues based on intelligent dispatch, AIOps automatically monitors their actions inside the solution as well as when they connect to remote systems to investigate and resolve issues.

Learning in the back-office falls in multiple categories:

- **New automations.** As many diagnostics and remediation tasks in IT are performed using command-line interfaces as opposed to UI-driven actions, AIOps automatically extracts these actions and results programmatically thereby building new automations directly. Obviously, adding variables, testing and hardening needs to be done, but extracting actionable content based on real live activities is the first step in building new automations.
- **Auto-correlating similar automations.** There are many ways to resolve similar issues in the IT environment based on experience and process adherence of the IT staff. AIOps takes advantage of sophisticated match and merge graph algorithms to correlate these different ways of resolving the issue when suggesting optimized remediations.
- **Auto-Update Matching Rules.** AIOps matching rules are based on tags as described earlier, however automated remediations require a high degree of certainty (deterministic reasoning). AIOps will present the engineer with probable matches which didn't cross the required level of certainty. If the engineer selects one of the probable options, the result (issue resolved or not) will be used to add matching rules automatically and improve the underlying algorithms.

Programmatical Enforced Process for Improvements

Actual day-to-day work (requests, incidents, changes, etc.) are usually tracked fairly accurately in ITSM solutions (tickets). Continuous improvements, however are usually not tracked individually as they are treated more as projects. Amelia AIOps changes that by identifying potential improvements and optimizations, and creating them as individual tasks which can be tracked just as other work that is being done in IT, and that takes advantage of the analytics, routing and task management capabilities inherent within the platform.

Fact-Based and Timely Analytics

Determining what constitutes an opportunity for improvement requires insight into the work that is not currently being automated and thus requires manual activities. Good analytics require clean data to begin with, and often manual work is not cleanly documented. Amelia AIOps solves this by digitally documenting the manual steps human engineers take to resolve tasks as part of the learning described above. Combined with meta-data collected during the process, such as time spent on individual steps in the process, the platform can start identifying and prioritizing improvement opportunities, i.e., it makes little sense to build automated solutions for infrequent tasks with low impact on the business.

Intelligent Dispatch

Once improvements have been identified by Amelia AIOps, it utilizes the built-in Workflow functionality to appropriately route the improvement task to the right engineer based on experience and expertise, i.e., if this is an optimization related to an existing automation solution, it would likely be routed to the individual who built or maintains that solution.

Summary

With Amelia AIOps providing a single autonomic backbone for information systems, IT organizations can deliver IT services in a cost efficient, scalable and modern way. AIOps helps them create end-to-end automation for IT operational tasks with an extensive and growing library of pre-trained autonomic skills. With Conversational AI, back office employees are given access to a built-in employee concierge that helps end users navigate internal or external systems. Help Desk staff have the support of a built-in IT whisper agent assisting staff with executing tasks and resolving employee issues. Best of all: AIOps is designed to continuously learn, which means AI is helping to build new and better automations all the time.

The automation of IT processes and democratized access to information systems-based results means the end of long ticketing queues, but it also means much more. Employees no longer need to fill out forms or search drop-down menus— they simply ask Amelia for service. They no longer need to understand backend processes or organizational structure to solve problems— they can ask Amelia for guidance.

In short: AIOps provides employees with the speed, access, scale and continuous improvement they need to do their jobs better than ever.

```

357     return this;
358 }
359
360 Carousel.prototype.getItemForDirection = function (direction, pos) {
361     var delta = direction === 'prev' ? -1 : 1;
362     var activeIndex = this.getItemIndex(this.$active);
363     var itemIndex = (activeIndex + delta) % this.$items.length;
364     return this.$items.eq(itemIndex);
365 }
366
367 Carousel.prototype.to = function (pos) {
368     var that = this;
369     var activeIndex = this.getItemIndex(this.$active);
370
371     if (pos > (this.$items.length - 1) || pos < 0) return;
372     if (this.sliding) return this.$element.one('slid.bs.carousel', function () { that.to(pos); });
373     if (activeIndex == pos) return this.pause().cycle();
374     return this.slide(pos > activeIndex ? 'next' : 'prev', this.$items.eq(pos));
375 }
376
377
378 Carousel.prototype.pause = function (e) {
379     e || (this.paused = true);
380
381     if (this.$element.find('.next, .prev').length && $.support.transition) {
382         this.$element.trigger($.support.transition.end);
383         this.cycle(true);
384     }
385 }
386
387

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Amelia is the world leader in Enterprise AI and the home of Amelia, the industry's most-human digital AI colleague. Amelia's ability to learn, interact and improve over time makes her the market's only AI that can fully understand user needs and intentions.

Learn more about Amelia at [Amelia.ai](https://amelia.ai).

Contact us at [Amelia.ai/contact](https://amelia.ai/contact).

AMELIA®