

Whitepaper on the safety of Robotic Process Automation
with AmdoSoft/**b4**



INTRODUCTION

Why integrate AmdoSoft/b4 Robotic Process Automation (RPA) into the enterprise?

Automation in the business world has been increasing rapidly since the beginning of the 21st century. At the forefront of this wave is Robotic Process Automation (RPA). It allows users to focus on higher value tasks by having software robots precisely and cost-effectively take over all standardized routine tasks. Robotic Process Automation is therefore an attractive solution for business enterprises to increase their productivity, reduce their expenses and thus - safely and sustainably - increase their efficiency.

Press reports from market researchers today show a predominantly high interest in RPA solutions for the German-speaking region from more than 50% of all companies. Worldwide, more than 20% of all companies already use an automation service. The reported efficiency increases vary between 50% and 80% compared to competitors.

The question of which processes should be taken over by software robots is of crucial importance, because an optimal result can only be achieved if the right processes are automated. It has been shown that the use of robots, especially in administrative areas such as customer service, accounting, human resources, healthcare and financial services with document management systems and implementation of compliance through digitized processes is associated with reduced expenses and increased processing speeds. In general, however, all other areas that contain digital, structured, rule-based, and time-intensive tasks can benefit just as much from Robotic Process Automation. Monotonous, repetitive tasks can be handed off and improved documentation results, as all processing steps can be precisely tracked and documented at any time.

Likewise, expensive human errors are ruled out, processes are strictly didactically specified and adhered to in all subsequent implementations.

The goal of AmdoSoft/b4 is to enable business users to independently create software robots that do not require any special APIs to interact with any third-party applications. The adaptation of the interface to laymen of programming allows even uninitiated people to take the role of a bot developer and design automations for the company within a few weeks.

The training of the b4 Bots is based on recordings of the execution of a work process; the fine-tuning is controlled via graphical interfaces. The automations themselves can be triggered by dates and times, by users or in response to an event.

As an example, one can simply imagine an automated response to an incoming document, which takes selected data, processes it further and forwards it to relevant employees in a filtered manner.

Two everyday examples here, for AmdoSoft in the past, were setting up automation for daily updating of energy prices in the ERP system for utilities and processing Corona test results for health departments. These processes were created, tested and put into operation by partners and employees of the respective institutions. They are in use 24/7 today.

From the above examples, one can already see the need for secure applications in order to maintain data secrecy and not allow strangers to access the data. This security in automation must go hand in hand with security in handling, scalability, reliability and user-friendliness of the platform. Only if both aspects are fulfilled, the integration of RPA on enterprise level will be successful.

The working steps of the AmdoSoft/b4 RPA solution, their separation by intelligent architectures and minimal permissions, the platform-internal end-to-end security standard and further external security options are described in this document in a comprehensible way.





ARCHITECTURE AND OPERATION

AmdoSoft/b4 components

To implement robot-controlled automation safely and efficiently at enterprise level, strong and reliable software is needed. Understanding the components is essential in this regard. In coordination with the currently practiced security standards, within the AmdoSoft/b4 platform the administrative level b4 Controller is separated from the executive level b4 Admin Bots and b4 Bots. The relationship of the individual components is shown in Figure 2. The b4 Controller is Windows server-based software. While b4 Bots work on all major Windows server and Windows workstation operating systems, b4 Admin Bots can be deployed on both Windows and Linux operating systems.

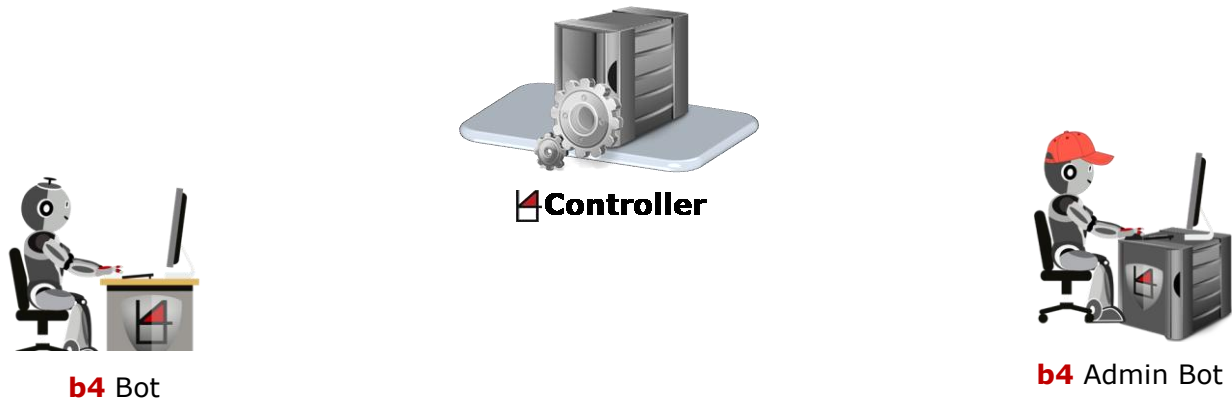


Figure 1: AmdoSoft/b4 components

b4 Controller

The b4 Controller is the main management center of the automation environment. All IT and business-relevant processes can be controlled from here and monitored in real time using the integrated applications b4 Dashboard (web app) and b4 Console (desktop app).

This engine is equipped with an encrypted database and can be connected to all b4 Admin Bots to extend centralized control to the entire system. In doing so, agents initiate connections across systems only via our EBS Client API and exchange information in the form of SSL-encrypted data. This keeps critical data confidential. Simultaneous work by multiple users at this management level is implemented through independent version controls and authorization, enabling a centralized hub where structures, services and maintenance work are coordinated, segregated and performed in a task-relevant manner across the enterprise.

b4 Admin Bots

b4 Admin Bots are installed on the desired subsystems and thus extend the functionalities of the b4 controller to the entire system. For this purpose, the user sends commands from the b4 Controller to the b4 Admin Bot, which are processed locally and answered in detail. In addition, the b4 Admin Bots ensure system security, provide a wide range of

monitoring options as well as IT automation via APIs.

Monitoring is performed by collecting user-defined system information. The agents create live alarms and reports on their own and send them encrypted back to the controller.

Separate from the controller, b4 Admin Bots process all operations and events of the software-controlled b4 Bots locally as an intermediate instance. This ensures the security of the subsystems and provides additional protection against data leakage through the use of external firewalls.

The differences between Admin Bots and Bots can be seen in the tasks and scopes they process. B4 Admin Bots correspond to IT administrators in the way they handle tasks. They are able to execute locally native scripts, for example in Bash or Powershell. For this purpose, there is a ready-made script library within the Automation Manager perspective of the console and the option to write your own scripts. The scripts can then be transferred in parallel as Advanced Executive Service (AES) to the Admin Bots and thus to the entire network system. With the specially developed internal interface, the development and distribution of scripts is thus a b4 internal process and the associated security in IT automation is a clear market advantage of AmdoSoft Systems.



b4 Bots

The software-controlled b4 Bots are the lowest, executive level of the RPA solution. They emulate all possible inputs and processes that a person would perform in any environment (apps, web apps) on the systems, directly on the desktop. These include frequently repeated processes such as editing emails, working in web or ERP environments, and filtering/collating information.

These processes can be easily recorded via recordings of the respective processes, during their execution by a user. The recording process is started by pressing a button in the b4 Console and runs in the background (visible only by a marker on the desktop). Shortcuts can be used to save screenshots for image reconstruction algorithms within the recordings, which then directly serve as references for sub-steps of the automation. All inputs from the creating user are recognized, listed in actions, archived and made available within the b4 Automation Manager perspective as so-called "Recordings". After testing and fine-tuning, these are then available as executable, automated and scalable processes that the bot can then implement across functions and systems. Here, depending on the user's task, additional requirements for performance, data integrity and security can be ensured. For example, keystrokes can be disguised as extra encrypted variables in addition to database encryption. The bots serve in both person-controlled assistant mode and independent worker mode.

Unlike Admin Bots, b4 Bots are more like clerks in their deployment. Bots execute the finished, coordinated processes, also called checkpoints (CP), as work steps within the applications of the assigned system environment. They have the same rights as a local user. The agents are to be understood as administrators. They exclusively execute the developed scripts and internal communication with the administration layer. A clear

advantage of incorporating the objects, scripts, and checkpoints into the same rule workflow of the Graphical Rule Editor perspective is that system administrative steps (AES) can be mapped into logical links with task-focused steps (CP). An example of this hybridization would be a fully automated system update followed by reinstallation or update of a user application entirely without repetitive manpower.

b4 ATTENDED BOT oder b4 UNATTENDED BOT

In the field of Robotic Process Automation (RPA), AmdoSoft provides two types of b4 bots: The "b4 Attended Bot" and the "b4 Unattended Bot".

The b4 Attended Bot closely collaborates with a human user. This bot operates in real-time and interacts with the user to automate tasks and enhance productivity. The user initiates the bot's actions, and the bot can assist the user by automating repetitive or time-consuming tasks. The b4 Attended Bot may, for example, function as a desktop assistant, aiding the user in performing tasks within applications or systems.

On the other hand, the b4 Unattended Bot is an autonomous RPA bot that operates without direct human interaction. This bot can automate scheduled or rule-based tasks on a large scale. The b4 Unattended Bot can work 24/7 and execute recurring tasks without the need for a user's presence. It can, for instance, handle data processing tasks in the background, generate reports, or synchronize systems to improve efficiency.

Both b4 Bot types offer distinct advantages and can be deployed in combination to optimize the automation of business processes. The b4 Attended Bot assists users in task execution, while the b4 Unattended Bot efficiently and autonomously automates repetitive processes.

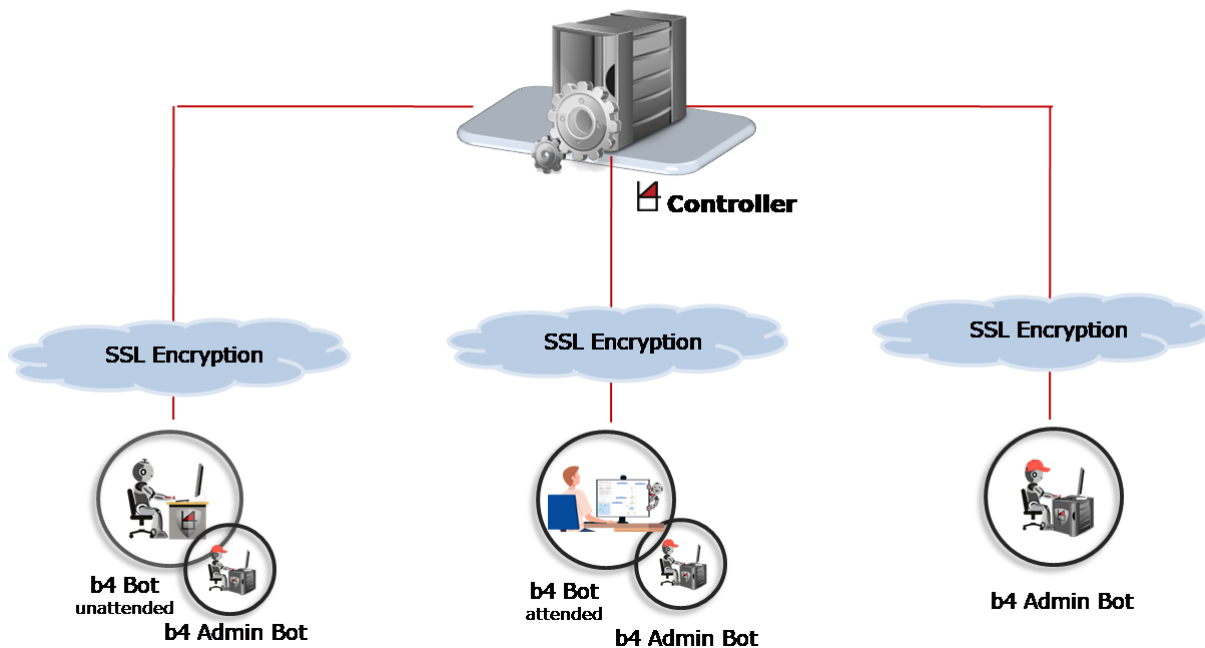
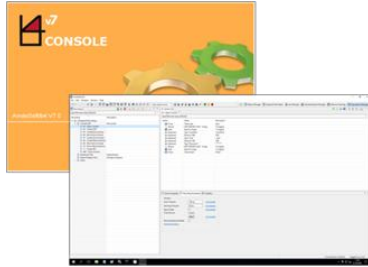


Figure 2: Architecture of the RPA solution by AmdoSoft/b4



AmdoSoft/b4 User Interfaces

The above components are mostly invisible to the user and work reliably and relentlessly in the background of the GUI applications. The three user interfaces are:



b4 Console



b4 Dashboard



b4 Report Designer

Figure 3: AmdoSoft/b4 User Interfaces

b4 Console

The main component of AmdoSoft/b4 is an application with multiple perspectives covering complete system administration, system monitoring and RPA solutions. The user is presented with all bots and system operation information based on detailed event logs through customizable live status messages, time series analysis and customer-specific reports.

A clear advantage of the AmdoSoft/b4 software is its origin in the field of IT automation. Thus, familiar task areas for system administrators and their processing are provided in a simple workflow. IT automations are realized from the object manager perspective via scripts and APIs over a few mouse clicks scalable to massive systems and maintenance work on parts of the system can be planned, configured, communicated and executed.

b4 Dashboard

The b4 Dashboard is the web application of the AmdoSoft/b4 tool. A variety of functionalities are available in the form of dashlets, small widget-like windows. Through a secured login, you gain access to customizable dashlets that display user-defined system resources and process-specific bot operations in detail in desired ways. This allows important information to be viewed securely on demand, regardless of location, and provides a rapid response to unforeseen events such as system failures or unwanted access to applications or machines.

b4 Report Designer

In the b4 Report Designer Engine (RDE), a separate application from the b4 Dashboard and the b4 Console, reports are designed for the company or customers. It is possible to create user profiles for the RDE without the user having to access the b4 Console.

Objects and status messages can be included in reports in RDE using placeholders without revealing their information to the editing users. Only the object names are visible in this perspective, but not the messages/information itself. Report formats can be created by drag-and-drop, the time periods of the information to be filled can be set and finally approved and filled with collected information from the b4 Console. This integration ensures that at least one developer/administrator (b4 Console) and one business user (RDE) are involved in generating a complete report; a structuring that reflects data security and best practice.

Logos, images, graphics and formatting can be easily incorporated, sized and adjusted via a grid structure. The objects are then incorporated automatically at the time of scheduled delivery. The Schedule Report Manager perspective of the b4 Console can then be used to configure automated reports, their deadlines, dates and delivery methods (e.g. e-mail).



RPA DEPLOYMENT, AUTHORIZATION AND PROCESSING DOMAINS

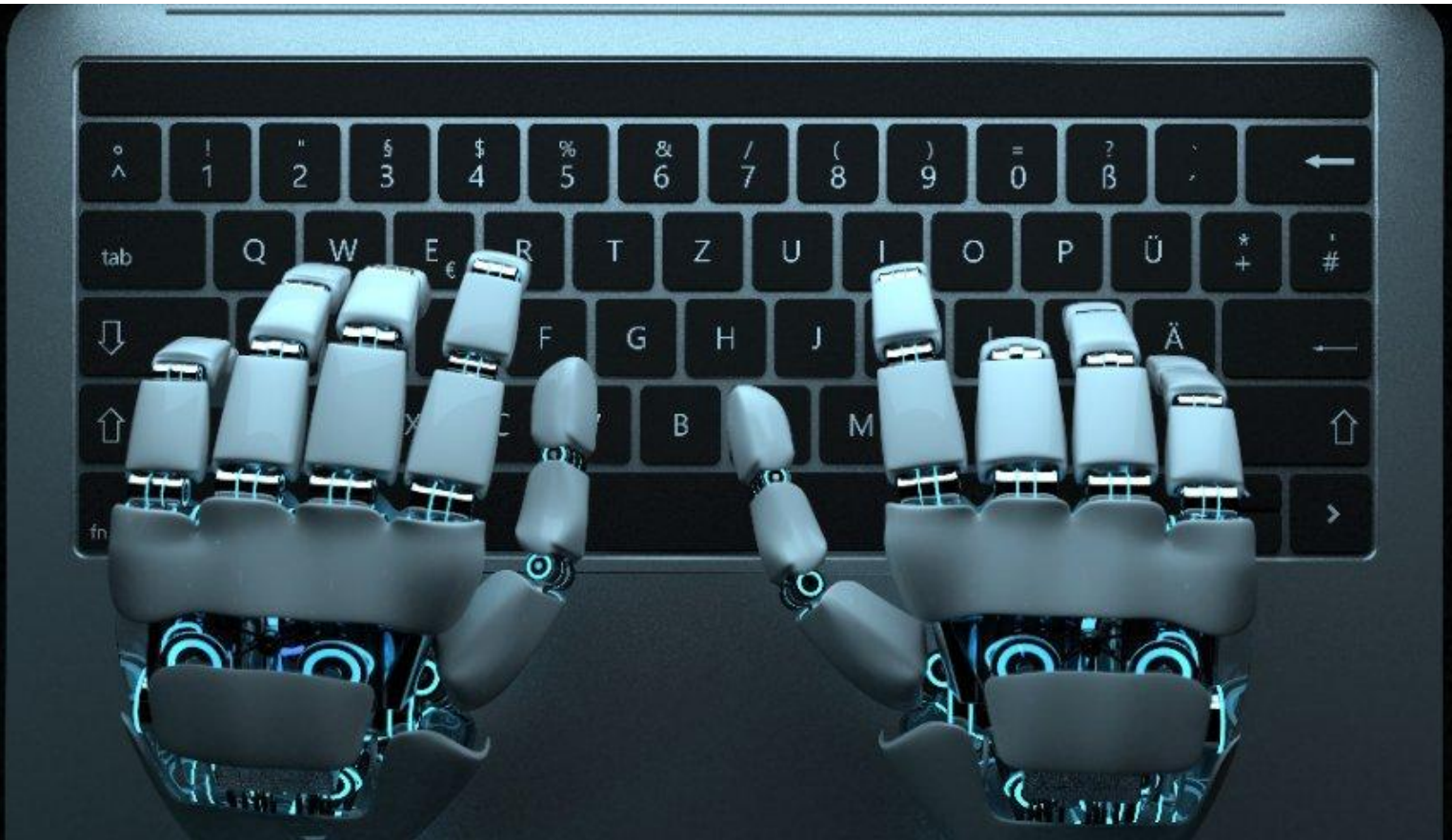
Deployment mode

To understand the safety of using software robots in automation, it is not enough just to know the tools. Of course, the way they work should also be transparent. Robotic Process Automation software efficiently and cost-effectively performs all standardized routine tasks. In general, a distinction is made between two forms of software robots: The assisted and independent work.

In assisted automation, the user monitors sub steps of the process. Thus, the robot can perform supporting tasks and wait for a final evaluation or confirmation from the user. Reasons for use include processes in which intermediate steps

must be interpreted and/or results that require instructions from a user. Collaboration can also refer to processes in which the robot performs a purely supportive task.

Unattended automations include all fully automatic processes and require no input from the user. No distinction is made whether a user starts the process or it is scheduled by a scheduler and started by a timer. This type of automation is very convenient because this user does not need to have any understanding of the actual process or automation of a robot. A bot developer can thus shorten or even completely remove complete and mostly repetitive tasks for an immense majority of business users through minimal input (targets, applications used, formats) - a clear time saver for the business. During bot execution, the user can then track the bot's work in real time and ensure that no exceptions or errors occur. The processes can be easily monitored in b4 Console and b4 Dashboard through live status messages and reports. The user does not need to be logged in to the working machine.





AmdoSoft/b4 RPA multi-level authentication

An essential part of the AmdoSoft/b4 security concept is the authentication of each entity before accesses or actions. If the entity cannot be authenticated or does not have the necessary permissions from the administrator, then access is denied, objects are made inaccessible and actions are blocked. All associated data is thus locked and shielded. No distinction is made between robots and humans in this treatment. In the following section, we provide for an illustrative comparison of authentication in standard processes between users and robots.

Comparison: User vs. Robot - authentication

The first scenario is a typical corporate authentication for a user. At the start of work, this user logs on to a Windows session. This first level of authentication is provided by the Windows log-in. To start a business process, a remote application is launched that handles possible critical company/customer data. For this, the user still needs a second authentication.

So the scenario involves a single user and his log-ins.

In the second scenario, unattended automation is used. In this case, a b4 Bot has been trained by a bot developer in the process and the access rights have been passed to the user for execution (per se, the creation of a bot and its access control is tied to further authentication by the bot developer). The user logs in to his Windows station with his Windows credentials as in the previous. After the first authentication, he uses his b4 console ID and password, which are matched against the encrypted database instance in this second authentication. The user maneuvers into the Object Manager perspective, which, in line with best practices, contains only the objects relevant to him. He starts the bot, which now takes over all manual tasks. To do this, the b4 Console establishes an encrypted connection to the b4 Controller, which must be approved via a TLS handshake protocol. If this secure connection takes place, a command is sent to the remote bot client on the targeted system with the desired remote application to execute the automation. The process is started by the bot client. This bot must also log in to the remote machine. This represents the third authentication level, which can also be set for the bots completely independently of previous user logins. From now on, status information of the process is made visible to the user within the b4 Console.

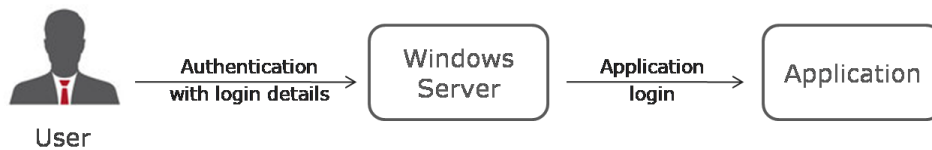


Figure 4: Enterprise authentication for a user

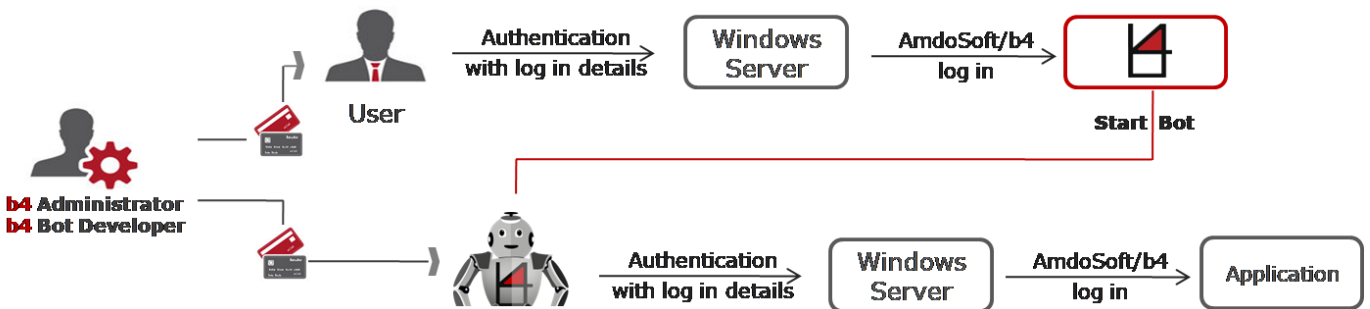


Figure 5: Unattended automation

By including a "timer object" in the workflow, the process flow can be executed automatically at specific times. With a defined "trigger object", certain changes or events on the subsystem or applications are reacted to and the process is started. For this purpose, however, all three authentications must again be run through during object creation.

The bottom line is that in terms of authentications, using b4 Bots doesn't remove a security roadblock that affects the user just as much. Additionally, another layer is added by using the AmdoSoft/b4 platform.



Role-based authorization

For access control enforcement, successful authentication is only the first stage in the AmdoSoft/b4 security structure. In order to comply with the basic principles of segregation of duties and minimal permissions, authorization is equally important. Authorization in AmdoSoft/b4 is implemented with configurable Role Based Access Control (RBAC). In this way, administrators, as a higher authority, can grant other users access rights to specific parts of the platform. This can be done either individually for individual users or by dividing multiple users into groups with definable rights.

There are three preset groups in the basic architecture of the b4 platform:

- SuperUser
- ObjectManager
- ReportsOnly

Participants of the SuperUser group have unlimited access to the various functions within the user interfaces and are equal to administrators. Group members in Object Manager have rights to view and edit objects within the b4 Console such as robots, recorded processes, work steps, monitors or timers (to name a few). This group is great for employees who are tasked with creating the automation of a b4 Bot.

Self-created groups can extend the classification of these groups and proceed in more detail. Thus, accesses to individual perspectives can be set within the b4 Console to further secure task areas by access rights. An extension represents the coordination for accesses to objects and subsystems with specific groups. The macroscopic subdivision of the workforce to the three user interfaces and associated authorizations can thus be freely adjusted.



Independent control environments

In addition to the extensive RBAC functions, AmdoSoft/b4 offers logical separation of tasks. The architecture of the platform is specially divided into several perspectives for this purpose, in order to clearly separate work steps in the creation of automation (and reporting).

The Automation Manager perspective on the b4 Console allows to record business steps. These are a simulation of a user's work steps and are recorded during the execution of a process. All user actions (mouse clicks, keystrokes ...) are compiled in a detailed list and can be edited directly after finishing a recording. Playback of the recordings is immediately executable on demand and can be verified in a test environment. As soon as safety checks have been successfully completed in the functional mode and it is certain that the process meets all requirements, the recordings can be transferred to a b4 Bot and are thus available for execution for the entire system in the form of a finalized checkpoint. Whether the process is defined specifically for only one machine or is to run independently on several machines is irrelevant. Subsequently, logical relationships and sequences of the work steps of a business process can be assembled into complete processes within the Graphical Rule Editor using diagrams and objects displayed as icons, even without programming knowledge. Functionalities such as checks of work processes and notifications via e-mail can be easily integrated here using drag-and-drop. The presentation in these flowchart-type diagrams, also called "rules", in combination with the live status messages and generated reports, enables an overview of thousands of parallel processes and relevant adjustments to changing market situations.

All created objects are controlled centrally from the Object Manager perspective. Processes are also started here, system resources and bots are monitored, or network structures are managed. The results can be quickly viewed using customizable status messages and descriptions.

This demarcation of development environments and production systems serves to provide additional security. The solutions already developed thus remain unaffected by new approaches. Automation is controlled by two levels, the development team and the business users.



Independent object approvals

The subdivision of environments is a macroscopic aid to ensure safe working in the area of RPA and system monitoring. Thereby, the different objects of one type, for example Recordings or Rules, are equated in basic state. Additional microscopic possibilities arise via object-specific permissions. In combination with the assignment of users to groups, objects and their functions can be tailored to employees.

Let's briefly review a situation for a processing domain. The developers create a checkpoint for the b4 Bot in which information from incoming emails is automatically filtered at the beginning of the working day and then collected in a separate mail. This is then to be sent as a circular mail to a subsection of the sales department. The options are now free whether to have a business user start the process or whether the process should happen fully automatically. In the second case, no authorization is required from the staff and the sub-area only sees the result in the form of an e-mail. In the first case, it is also possible to separate rules and checkpoints assigned to this process from all other processes. For this purpose, only members of a certain group are allowed to execute and see the process in the object settings, but not to modify or delete it. The process is thus additionally protected against human errors.

The result is further isolation of related data and apps at the organization level, as individual users cannot see or control objects outside their respective domains.

Name	Status
b4 Management	UP
Resources	UP
LocalResource	UP
Rules Engine Service	UP
Services	UP
Rules	UP
b4 Rules	UP
Administrative Tasks	UP
Mail Check	DISABLED
Start Mailing Application	DISABLED
b4 Templates	UP
Customer Austria	UP
Linux Cluster	UP
Customer Machine Proper Setup	UP
Customer GenericService-Drivers Software	INSTALLED
Customer SystemManagement-SMM Software	INSTALLED

Figure 7: Object view user

Name	Status
b4 Management	UP
Resources	UP
LocalResource	UP
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Services	UP
Rules	UP
b4 Rules	UP
Administrative Tasks	UP
Mail Check	DISABLED
Start Mailing Application	DISABLED
b4 Templates	UP
Customer Austria	UP
Linux Cluster	UP
Customer Machine Proper Setup	UP
Customer GenericService-Drivers Software	INSTALLED
Customer SystemManagement-SMM Software	INSTALLED
Customer Germany	DOWN
Windows Cluster	DOWN
Customer Machine Disconnected	UNREACHABLE
GenericService-Drivers Software	UNREACHABLE
Customer b4 Agent Heap Usage	UNREACHABLE
Customer CPU Utilization Service	UNREACHABLE
Customer Disk Utilization Service	UNREACHABLE
Customer Memory Usage Service	UNREACHABLE

Figure 6: Object view developer

END-TO-END DATA PROTECTION

Multi-instance authentication combined with high-precision access control is essential for a controlled work domain. To ensure data protection at all levels, business-specific data, processes, and related information must also be protected during the functions of the deployed software.

The AmdoSoft/b4 platform defends user data with multiple security measures. In this regard, the encrypted database is only the first step in coverage. Additional steps to shield data at rest, used on a system, or exchanged between systems are outlined in summary in the following sections.



Encrypted databases and dormant data security

The b4 Controller, b4 Admin Bot and b4 Bot object databases (SQL DB) are encrypted using a standardized cypher algorithm. All information and data, including data used for IT automation and RPA, is secured. For sensitive system or user data (e.g. stored passwords), additional key-generator algorithms are in use. As part of AmdoSoft's quality controls, interfaces to these databases are scanned daily during the development process and possible vulnerabilities are eliminated before they are ever used in production environments.

Information secured on the controller database includes users' stored credentials and their access rights, all data required for the bot runtime, i.e. all credentials for third-party applications or system-critical log-ins for (virtual) machines. The runtime parameters also include configuration as well as provided version control and mailing services. Accordingly, backup is a top priority. To this end, additional daily database scans are run during the development process to determine whether data critical to the user can be extracted. If this is possible, the new implementation is discarded and this security vulnerability is fixed with the highest priority.

The b4 Admin Bot/b4 Bot databases contain only the most necessary data for the execution of remote processes. They are intentionally designed to be "deaf and dumb" to all other information and have no rights to request it. A third encryption of process input parameters as encrypted variables within the Automation Manager perspective adds another layer of protection.



Security during transmission

The exchange between controller and clients (bots/agents) is protected by the TCP/IP protocols and the encryption protocol Transport Layer Security (TLS) 1.2. The TLS handshake protocol ensures that the identity of the two instances is checked and a connection is only established after the matching keys have been generated and exchanged. The connection setup only ever takes place from the client side and enables additive protection by a firewall. Due to this one-sided connection structure, it is possible to set the contact to a single TCP port, which can be defined and configured by the administrator, and through which the exchange of information is limited and secured. This is where our knowledge gained in over 20 years of IT automation pays off, as our specially developed EBS client API is secured by an excellent and daily tested cyber suite. By encrypting the transmitted data, even a complex setup of VPNs for each client becomes optional. In small to medium sized projects this effort is still negligible. However, when setting up hundreds or thousands of TCP ports for agents/bots, this process consumes resources that would be better invested elsewhere.

Safety during processing

For use during automation by bots, protection must also be extended to the runtime. For this, only the minimum of data needed for the process is processed. Further protection mechanisms are provided during runtime by b4 Console functions. Unauthorized access in the form of data leaks or by interfering with bots can be prevented by the following accurate actions.

Via the central control it is possible to monitor all log-ins, actions and processes on the b4 controller or remote b4 Bot side, and if necessary to pause, stop, reset and restart them with different settings. This includes all automation related functionalities up to agents and bots.

b4 Bot Runtimes can be set to defined time periods. In detail, dates and runtimes of individual work steps, sub-processes and also the duration of the entire process can be set independently. Automation is stopped if the set time is exceeded. This limits intervention by third parties via time factors.

Checking the interfaces

In order to secure interfaces of the server-client connection, AmdoSoft relies on its own quality controls as well as additional, external protection by Vulnerability Management Scanning from Qualys, Inc. This looks at it from the same perspective as potential attackers. A pre-scan scans all common TCP ports and attempts to gather information about the processes and operating system taking place there. The unique conclusion-based scan engine then checks whether there are vulnerabilities on the operating system, services and applications of the hosts found. The constantly updated threat list makes it possible to react spontaneously to emerging threats and quickly secure them, hot fixing them to older versions of the software if necessary.



EXTERNAL RPA FUSE

The AmdoSoft/b4 architecture includes Windows desktop, web as well as server class structures for the central controller, remote clients and user interfaces. To embed the platform fluently into a business environment, external security measures are also recommended.

Protection from viruses through anti-malware

Both server and client instances, such as the remote b4 Console and b4 Bots, run on the corporate desktop infrastructure. To protect them from virus and malware attacks, it is recommended to use trusted antivirus/anti-malware programs. To do this, only the settings for the b4 platform services need to be adjusted.

Firewall protection

The use of local, server and network-based firewalls is supported by the separate architecture.

By default, settings should be made to allow only the controller/agent protocols enterprise-wide. Network-based firewalls should be deployed to separate the various RPA development, test and production environments from each other and the rest of the corporate network. In this regard, long-term unattended automation should be operated with additional care in more isolated environments. As part of the minimal authorizations, it goes without saying that only the resources needed for the process are made available.

Protection through IPS

To prevent direct external attacks on the b4 platform, it is a good idea to install an additional external IPS (intrusion prevention system) behind the firewall. The IPS acts in the network traffic flow between server and client, responding to threats based on pre-detected anomaly-based or fixed signatures and taking automatic steps to reject the received packets and stop the traffic from the source address.





CONCLUSION

The AmdoSoft/b4 Robotic Process Automation solution is a secure platform that, through smart business structures and targeted deployment, represents a clear added value for the productivity and efficiency of future-oriented companies. Automate monotonous, repetitive processes, giving employees more time to focus on more important, creative tasks. We would also like to help you with this, with security in automation, as well as security through reliability, scalability and user-friendliness in dealing with the b4 platform.

For more information about AmdoSoft Systems and our services please go to www.amdosoft.com.

Our Business
is
to Automate
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