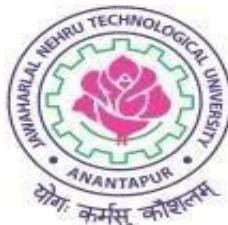


AUTOMATING CUSTOMER SUPPORT TICKETS WITH RPA

A PROJECT REPORT

Submitted to



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR,
ANANTHAPURAMU**

*In partial fulfillment of the requirements for the award
of the degree of*

BACHELOR OF TECHNOLOGY

**IN
COMPUTER SCIENCE AND ENGINEERING**

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Permanent Affiliation to JNTUA & Approved by AICTE Recognized under Sections 2(f) & 12(B)
of UGC act 1956. Accredited by NBA, New Delhi & NAAC Bangalore with 'A' Grade,
Tirupati-517507, Chittoor, A.P.

2018-2022

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CERTIFICATE

This is to certify that the project entitled “AUTOMATING CUSTOMER SUPPORT TICKETS WITH RPA” is a bonafide work done by “**V Jyotheeshkar Reddy 18BF1A05H3, R Ismail Irshad 18BF1A05E1, S Suhani Abbas 18BF1A05F3, Sathya Neil Chowdary Daruru 18BF1A05E7**”, in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Computer Science and Engineering, from Jawaharlal Nehru Technological University Anantapur, Ananthapuramu during the year 2021-2022.

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We hereby declare that the project report entitled “AUTOMATING CUSTOMER SUPPORT TICKETS WITH RPA” done by us under the esteemed guidance of Dr. R Swathi, M.Tech, Ph.D(CSE), Associate Professor and Head of The Department and is submitted in partial fulfillment of the requirements for the award of the Bachelor’s of Technology in Computer Science and Engineering.

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ABSTRACT

Robotic process automation (or RPA or RPAAI) is an emerging form of clerical process automation technology which is based on the notion of software robots or on artificial intelligence (AI) workers. Robotic process automation (RPA) is the application of a technology that allows employees in a company to configure computer software or a robot to In such a manner so as to capture and interpret existing applications for processing a transaction, manipulating data, triggering responses, and communicating with other digital systems.

Robotic process automation is a particularly useful tool that allows organisations to automate business process thereby leading to an increase in efficiency. In many organizations, the IT support team usually has to deal with an enormous amount of help tickets that are being generated on a daily basis. These tickets could be raised regarding various issues.

This project proposes a model which allows tickets which have been raised repeatedly to gain access to a solution that has been tried and tested and as such is reliable. The implementation of this project on a large scale within an organization could easily save money and time. Instant replies also allows the organization to retain a good client relationship and fosters goodwill for the organization.

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1. INTRODUCTION

RPA is simple—and powerful—and is a piece of highly customized software, often called a Software Robot or a BOT, that when deployed perform a variety of tasks as a part of the Digital Enterprise. Robotic Process Automation enables you with tools to create your own software robots to automate any business process. Your "bots" are configurable software set up to perform the tasks you assign and control. RPA bots can learn. BOTs can also mimic human actions within van enterprise. Over the past 5 years, BOTs have become increasingly common as they are great at handling repeatable and predictive tasks. BOTs have also been shown to dramatically reduce costs, as well as increase effectiveness and agility, regardless of the use of onshore or offshore labor. It's code-free, non-disruptive, non-invasive, and easy.

Any company that uses labor on a large scale for general knowledge process work, where people are performing high-volume, highly transactional process functions, will boost their capabilities and save money and time with robotic process automation software.

Just as industrial robots are remaking the manufacturing industry by creating higher production rates and improved quality, RPA “robots” are revolutionizing the way we think about and administer business processes, IT support processes, workflow processes, remote infrastructure and back-office work. RPA provides dramatic improvements in accuracy and cycle time and increased productivity in transaction processing while it elevates the nature of work by removing people from dull, repetitive tasks. The technology of RPA can be applied specifically to a wide range of industries.

The scope of RPA is not limited to any domain, it can be used widely across different domains. In the near future we are going to see the adoption of RPA in various domains. In the near – future and long term future we shall also see RPA being used along with other tools and technologies. It is also believed that the next transitional phase of the RPA will be AI.

Here for this project the RPA tool we are using is UiPath.

Historic Evolution

Although the term "robotic process automation" can be traced to the early 2000s, it had been developing for a number of years previously. RPA evolved from three key technologies: screen

scraping, workflow automation and artificial intelligence.

Screen scraping is the process of collecting screen display data from a legacy application so that the data can be displayed by a more modern user interface. The advantages of workflow automation software, which eliminates the need for manual data entry and increases order fulfillment rates, include increased speed, efficiency and accuracy. Lastly, artificial intelligence involves the ability of computer systems to perform tasks that normally require human intervention and intelligence.

As a form of automation, the same concept has been around for a long time in the form of screen scraping but RPA is considered to be a significant technological evolution of this technique in the sense that new software platforms are emerging which are sufficiently mature, resilient, scalable and reliable to make this approach viable for use in large enterprises (who would otherwise be reluctant due to perceived risks to quality and reputation).

By way of illustration of how far the technology has developed since its early form in screen scraping, it is useful to consider the example cited in one academic study. Users of one platform at Xchanging - a UK-based global company which provides business processing, technology and procurement services across the globe - anthropomorphized their robot into a co-worker named "Poppy" and even invited "her" to the Christmas party. Such an illustration perhaps serves to demonstrate the level of intuition, engagement and ease of use of modern RPA technology platforms that leads their users (or "trainers") to relate to them as beings rather than abstract software services. The "code free" nature of RPA (described below) is just one of a number of significant differentiating features of RPA vs. screen scraping.

Deployment

The hosting of RPA services also aligns with the metaphor of a software robot, with each robotic instance having its own virtual workstation, much like a human worker. The robot uses keyboard and mouse controls to take actions and execute automations. Normally all of these actions take place in a virtual environment and not on screen; the robot does not need a physical screen to operate, rather it interprets the screen display electronically. The scalability of modern solutions based on architectures such as these owes much to the advent of virtualization technology, without which the scalability of large deployments would be limited by available capacity to manage physical hardware and by the associated costs. The implementation of RPA in business enterprises has shown dramatic cost savings when compared to traditional non-RPA solutions.

Differences between RPA and regular automation

What distinguishes RPA from traditional IT automation is the ability of the RPA software to be aware and adapt to changing circumstances, exceptions and new situations. Once RPA software has been trained to capture and interpret the actions of specific processes in existing software applications, it can then manipulate data, trigger responses, initiate new actions and communicate with other systems autonomously. RPA software is particularly useful for organizations that have many different and complicated systems that need to interact together fluidly.

For instance, if an electronic form from a human resource system is missing a zip code, traditional automation software would flag the form as having an exception and an employee would handle the exception by looking up the correct zip code and entering it on the form. Once the form is complete, the employee might send it on to payroll so the information can be entered into the organization's payroll system.

With RPA technology, however, software that has the ability to adapt, self-learn and self-correct would handle the exception and interact with the payroll system without human assistance.

Characteristics of RPA software

Code-Free

RPA does not require programming skills: Business operations employees - people with process and subject matter expertise but no programming experience - can be trained to independently automate processes using RPA tools within a few weeks. Many RPA platforms present a flowchart designer, much like Microsoft Visio: process definitions are created graphically by dragging, dropping and linking icons that represent steps in a process.

Non-disruptive

One of the challenges of traditional IT deployments is that the transformation or change of existing systems is complex and risky. Thus, many large organizations are reluctant to redesign, replace or even enhance existing systems through the creation of new IT interfaces (or APIs). For this reason, the philosophy behind RPA is to avoid the complexity and risk of such changes

where they are not warranted, (or indeed to enable such changes to be prototyped and tested, simply by simulating equivalent input/output via the user interface in lieu of APIs). RPA tools therefore lean towards "light" IT requirements and do not, for example, disturb underlying computer systems. The robots access end user computer systems exactly as a human does - via the user interface with an established access control mechanism (e.g. logon ID and password) - so no underlying systems programming need be required. This is an important point because, from a security, quality and data integrity perspective, the UI of many applications encapsulates many years of requirements and testing for error prevention, data integrity and security access control. To bypass a UI by creating a new API is a risky undertaking and requires extensive testing in order that the same levels of functionality and protection are maintained.

Business user friendly

RPA's relative ease of use and low requirement for technical support perhaps explains why adoption typically originates inside business operations and not inside Information Technology (IT) departments. Because RPA projects do not require expensive IT skills and investment in new platforms, the economic threshold of processes with a viable business case for automation is substantially lowered.

Scalability: Organizations shouldn't select RPA software that requires them to deploy software robots to desktops or virtualized environments. They should look for RPA platforms that can be centrally managed and scale massively.

Speed: Enterprises should be able to design and test new robotic processes in a few hours or less, as well as optimize the bots to work quickly.

Reliability: As companies launch robots to automate hundreds or even thousands of tasks, they should look for tools with built-in monitoring and analytics that enable them to monitor the health of their systems.

Simplicity: Organizations should look for products that are simple enough that any employee in the business can build and use them to handle various kinds of work, including collecting data and turning content into information that enables leaders to make the best business decisions.

Intelligence: The best RPA tools can support simple task-based activities, read and write to any data source, and take advantage of more advanced learning to further improve automation.

Enterprise-class: Companies should look for tools that are built from the ground up for

enterprise-grade scalability, reliability and manageability.

Top RPA vendors

Automation Anywhere Inc. provides an enterprise digital workforce platform geared toward procure-to-pay, quote-to-cash, HR, claims processing and other back-office processes.

Notable RPA software vendors include:

Automation Anywhere

BlackLine

Blue Prism

Datamatics

EdgeVerve

HelpSystems

Jacada

Kofax

NICE

Pegasystems

Verint

UiPath

Blue Prism focuses on providing organizations in regulated industries with more agile virtual workforces, offering desktop-aligned robots that are defined and managed centrally.

EdgeVerve Limited, an Infosys company, helps enterprises modernize customer service, improve business processes and enhance operational productivity.

HelpSystems enables companies to streamline IT and business operations by automating tasks and workflows without the need to write code.

UiPath offers an open platform to help organizations efficiently automate business processes.

Workfusion combines robotics, AI-powered cognitive automation and workforce orchestration to automate enterprise business processes.

C-level decision-making around RPA

Though automation software is expected to replace up to 140 million full-time employees worldwide by 2025, many high-quality jobs will be created for those who maintain and improve RPA software.

When software robots do replace people in the enterprise, C-level executives need to be responsible for ensuring that business outcomes are achieved and new governance policies are met.

Automating Customer Support Tickets With RPA

Robotic process automation technology also requires that the CTO/CIO take more of a leadership role and assume accountability for the business outcomes and the risks of deploying RPA tools.

Additionally, the COO, CIO and chief human resources officer, as well as the relevant C-level executive who owns the process being automated, should all work toward ensuring the availability of an enterprise-grade, secure platform for controlling and operating bots across systems.

Impact of RPA on employment

According to Harvard Business Review, most operations groups adopting RPA have promised their employees that automation would not result in layoffs. Instead, workers have been redeployed to do more interesting work. One academic study highlighted that knowledge workers did not feel threatened by automation: they embraced it and viewed the robots as teammates. The same study highlighted that, rather than resulting in a lower "headcount", the technology was deployed in such a way as to achieve more work and greater productivity with the same number of people.

Conversely however, some analysts proffer that RPA represents a threat to the Business Process Outsourcing (BPO) industry. The thesis behind this notion is that RPA will enable enterprises to "repatriate" processes from offshore locations into local data centers, with the benefit of this new technology. The effect, if true, will be to create high value jobs for skilled process designers in onshore locations (and within the associated supply chain of IT hardware, data center management, etc.) but to decrease the available opportunity to low skilled workers offshore. On the other hand, this discussion appears to be healthy ground for debate as another academic study was at pains to counter the so-called "myth" that RPA will bring back many jobs from offshore.

The future of RPA

A Global Market Insights Inc. report expects the RPA market to reach \$5 billion by 2024. The increased adoption of RPA technologies by organizations to enhance their capabilities and performance and boost cost savings will reportedly drive the growth of the robotic process automation market most during that time.

The future of RPA is subject to much speculation, as the early majority adopt the technology and discover new uses and new synergies. Possible future trends may include:

- A convergence of BPM and RPA tools, much in the way that the distinction between BPM and workflow tools is now blurred. The acquisition of OpenSpan in 2016 by Pegasystems is perhaps just one early indication of such a convergence.
- Greater incorporation of artificial intelligence (AI) for advanced decision making and inferencing, leading to RPAAI. Some analysts speculate about such developments but, as yet, it is not easy to identify verifiable public domain case studies which provide evidence of this type of technology being deployed alongside RPA.

Impact on Society

Academic studies project that RPA, among other technological trends, is expected to drive a new wave of productivity and efficiency gains in the global labor market. Although not directly attributable to RPA alone, Oxford University conjectures that up to 35% of all jobs may have been automated by 2035.

In a TEDx talk hosted by UCL in London, entrepreneur David Moss explains that digital labor in the form of RPA is not only likely to revolutionize the cost model of the services industry by driving the price of products and services down, but that it is likely to drive up service levels, quality of outcomes and create increased opportunity for the personalization of services.

Meanwhile, Professor Willcocks, author of the LSE paper cited above, speaks of increased job satisfaction and intellectual stimulation, characterizing the technology as having the ability to "take the robot out of the human", a reference to the notion that robots will take over the mundane and repetitive portions of people's daily workload, leaving them to be redeployed into more interpersonal roles or to concentrate on the remaining, more meaningful, portions of their day.

Applications of RPA

Some of the top applications of RPA include:

Process automation

Technologies like presentation-layer automation software – a technology that mimics the steps of a rules-based, non-subjective process without compromising the existing IT architecture – are able to consistently carry out prescribed functions and easily scale up or down to meet demand. Process automation can expedite back-office tasks in finance, procurement, supply

chain management, accounting, customer service and human resources, including data entry, purchase order issuing, creation of online access credentials, or business processes that require “swivel-chair” access to multiple existing systems.

IT support and management

Automated processes in the remote management of IT infrastructures can consistently investigate and solve problems for faster process throughput. RPA can improve service desk operations and the monitoring of network devices. Separating scalability from human resources allows a company to handle short-term demand without extra recruiting or training.

Automated assistant

As in voice recognition software or automated online assistants, developments in how machines process language, retrieve information and structure basic content mean that RPA can provide answers to employees or customers in natural language rather than in software code. This technology can help to conserve resources for large call centers and for customer interaction centers.

Benefits of RPA

Robotic process automation technology can help organizations on their digital transformation journeys by:

- Enabling better customer service
- Ensuring business operations and processes comply with regulations and standards
- Allowing processes to be completed much more rapidly
- Providing improved efficiency by digitizing and auditing process data
- Creating cost savings for manual and repetitive tasks
- Enabling employees to be more productive

Conclusion

As RPA brings more technologically-advanced solutions to businesses around the world, operating models that adopt automation, whether in-house or offshored, will cut costs, drive efficiency and improve quality.

2. LITERATURE REVIEW

The Process of automating the workflows with the help of robots/software to reduce the involvement of humans is said to be Robotic Process Automation. Over here there are mainly three terms that need to be understood: *Robotic*, *Process* and *Automation*

- **Robotic:** Entities which mimic human actions are called Robots.
- **Process:** Sequence of steps which lead to a meaningful activity. For example, the process of making tea or your favourite dish, etc.
- **Automation:** Any process which is done by a robot without human intervention

If we summarize all the terms together then, mimicking human actions to perform a sequence of steps that lead to meaningful activity, without any human intervention is known as Robotic Process Automation.

The benefits of RPA are wide-ranging and far-reaching. You can put software robots to work to achieve significant and measurable improvements in areas of your business that range from customer satisfaction and employee engagement through to process speed, accuracy and cost efficiency.

RPA is the technological imitation of a human worker with the goal of automating structured tasks in a fast and cost-efficient manner. Even that the term “robot” brings to our minds visions that it is a machine that is capable of carrying complex series of actions automatically. It is important to know that RPA is not a physical robot but a software- based solution that is configured to carry out repetitive operational tasks and procedures that are used to be done by humans.

RPA can automate rules-based processes that involve routine tasks, structured data and deterministic outcomes, for example, transferring data from multiple input sources like email and spreadsheets to systems like ERP and CRM systems. RPA applications are created for automating the tasks of business like validating the sale of insurance premiums, generating bills, up-to date records, etc. One “Robot” equals to one software license in IT side. The traditional software communicates with other IT system through back- end whereas this robot is integrated across IT systems through front-end. So it is possible to integrate RPA with virtually any software used by a human worker, regardless of its openness to third party integration. According to the Institute of Robotic Process Automation (IRPA), RPA technology is not a part of a company’s information technology infrastructure, but rather sits on top of it.

RPA distinguish itself from other automation technologies like Business Process Management Systems (BPMS) by some characteristics which are as follows:

- RPA sits on the top of existing systems and access these platforms through the presentation layer, so no underlying systems programming logic is touched.
- In contrast to most BPMN modeling packages, RPA solutions do not require programming skills for software interface configuration. RPA is set to work by just dragging, dropping and linking icons.
- RPA doesn't create a new application and does not store any transactional data, so there is no need of a data model or a database like BPMS systems.

RPA is also different from cognitive automation. Cognitive Automation is used to automate tasks and decisions that involve algorithms to interpret unstructured data resulting in a set of likely answers, as opposed to RPA that uses rules to process structured data and instructions according to Willcocks and Lacity. In RPA a single deterministic result is obtained as a probabilistic outcome of cognitive automation.

A Capgemini study suggest that an RPA software license can cost between 1/3rd to 1/5th of the price of an full-time employee (FTE). Lacity and Willcocks sustains that one robot can perform structured tasks equivalent to two to five humans. Although the benefits in cost savings that companies report with RPA, not every business process is suitable for its use. Fung suggest some criteria of business process for RPA:

- Low cognitive requirements: Task that does not requires creativity, subjective judgment or interpretation skills.
- High volume: Tasks that are performed more often.
- Access to multiple systems: The process that requires access to multiples systems and applications to perform the job.
- Limited exception handling: Tasks that are highly standardized with limited or no exceptions to handle.
- Human error: Tasks that are prone to human error due to manual labour.

3.SYSTEM ANALYSIS AND FEASIBILITY STUDY

3.1.Existing Method:

Many things have changed in the world of business over the last decade. But a step change improvement in office data processing is not one of them. Workers have to still fill in the forms. Use paper forms to bridge between organizations , processes or systems. Take data from one system and then enter into another.

Now a days workers are different too:

People today blent how they spend their time like never before. They work on the move ,check business emails into the evenings and on weekends. But in return they expect to access their social apps and communities during the work time.

45 hours a month per worker are spent on the tasks that are boring, repetitive and mundane. These tasks take away their primary time and impact their quality of life.

Business is different too: Valuations have less to do with physical assets a business has and focus more on soft assets like the size of online communities , the data assets the organizations hold , and the ability of a business to convert clicks to cash.

Companies can scale faster , thanks to cloud computing and reach their target audience thanks to World Wide Web and mobile computing. Thus, failing to automate these lightweight data handling and processing tasks may lead to negative results or impact in :

- Productivity
- Customer Experience
- Innovation
- Moral
- Attrition

3.2. PROPOSED SYSTEM:

All businesses need an operational boost and want to optimize their processes. Back-end menial tasks hold a considerable chunk of your operational efficiency. Once these tasks are entirely or

partly automated, your workforce can focus on the more essential ones, thus, skyrocketing your productivity as an organization. Businesses of today want to leverage automation- whether in its most minimal form or in its entirety. For enterprises, automation means:

- Making processes efficient.
- Saving the workforce for decision making and other tasks still not in the ambit of robots.
- Reducing the costs of operation.
- Minimizing manual errors and faults.

With RPA, organizations can leverage quick-to-deploy, cost-efficient tools to infuse efficiency and intelligence to their processes- thereby significantly impacting their profits and revenue. Small and medium businesses, in particular, would benefit from the technology as in these businesses, a handful of people handle myriad of issues, including lowering operational costs, bringing new business, retaining existing business, improving workforce productivity, enhancing the quality of products and services, etc.

These businesses are in a better position to reap the following benefits from Robotic Process Automation-

- Improving workforce productivity and headcount flexibility
- Integrates With Existing Business Applications
- Detecting revenue leakages from the organization
- Reducing service costs significantly
- Improving the accuracy of data and its processing speed with reduction in manual errors
- Employees are left with the time and energy to focus on activities around decision making, strategizing, etc.
- A laser-sharp focus on the front office as the back office gets automated
- Ease of documentation of the business processes
- Faster service with bots working at lightning speed

3.3. FEASIBILITY STUDY

RPA's promise to provide organizations the ability to effectively adapt to operational demands and business needs on a whim. Consequently, the deciding factors in selecting an RPA solution should include how quickly and easily the solution responds to business requirements, changes, exceptions or increasing operations.

Automating Customer Support Tickets With RPA

Some robots can execute a variety of processes, and in special cases, such as with Leo robots, a single robot can execute unlimited processes, allowing you to scale up operations at peak periods without accruing additional costs.

In RPA adoption, what's not to neglect your human workforce and support to your employees, keep looking for multi-faceted solutions that blend technologies to provide informed decision-making, fast execution, analytics, mobility and other solutions that empower people to get the job done.

However, enterprise organizations may need as much as \$20 million, for a complete RPA solution of up to 500 robots, which can do the job of over 1,000 employees, and generate over \$100 million in savings.

The following is the feasibility checklist for identifying a process that can be automated successfully

- Structured Process
- Clear decision logic
- Defined or definable workflow
- Uses multiple applications or tools
- No emotion or subjectivity
- Prone to human error
- Unfulfilling
- High volume / low to medium complexity
- Low volume / high complexity
- 24 hour operation
- Legacy or external applications
- Part automation

3.4. OTHER IMPORTANT FACTORS:

Other factors that you need to include while selecting the process for RPA development would be application stability and frequency of procedure changes. They don't impact Automation feasibility but impact the ROI.

Which applications are harder or easier to automate?

- Browser-based and legacy applications are generally easier to automate than traditional Windows-based client applications.

What is the release cycle of the RPA involved applications and how likely are they subject to changes that may impact the automation?

- If the applications change infrequently, the UiPath can spend less time on making the automations flexible and durable. However, if the applications change often, especially without a lot of lead time as is frequently the case with auto updates, the UiPath should spend considerably more time creating an automation that is more durable and adaptive to changes such as field placement and label changes.

How difficult will it be to get an appropriate amount of test data from the users?

- In order to properly test an automation, there needs to be sample data made available that tests every rule and condition defined in the specification. Insufficient test data and improper testing is the number one reason why RPA solutions are recalled from production and refactored. It is better for everyone involved if the automation is sufficiently tested before it is migrated into production.

3.4. FINAL ANALYSIS

Feasibility check for our project Automating Customer Support Tickets With RPA:

- It is a simple rule based process, no complex process involved
- No specific application/s involved in the process - therefore the project is durable
- It can be operated 24x7 without any human attention needed
- Being a simple and small process there are very less chances of getting errors
- The process does not involve any kind of ambiguity situations

Therefore the process that we have chosen to automate and the tool we have chosen to develop the automation are feasible for the successful completion of the project

4. ENVIRONMENTS

4.1. OPERATING SYSTEM COMPATIBILITY

Both 32-bit and 64-bit OS versions are supported.

Enterprise Control Room operating system compatibility

Enterprise Control Room can be installed on machines running the following operating systems.

Windows version	Windows edition	UiPath community version
Server 2016	Standard and Datacenter	2022.4

4.2. PLATFORM COMPATIBILITY

Enterprise Control Room platform compatibility

Enterprise Control Room versions support the listed operating systems on a variety of platforms:

Servers

All listed operating systems and Enterprise Control Room versions

Cloud servers

Amazon Web Services EC2, Google Cloud Platform, Microsoft Azure Virtual Machines. All listed operating systems.

Note:

Amazon Workspace, Google App Engine/Desktops and Azure Virtual Desktops are not supported.

4.3. SOFTWARE FEATURES

A multi-threaded application

Enterprise client is a multi-threaded application, it performs multiple tasks in parallel including bot tasks, such as:

- Sending the Operational Analytics data to the Control Room .
- Maintaining the queue for other bot if there are multiple bots deployed on the same

Bot Runner.

- Monitoring the pause, resume and stop events for bot during the bot execution
- Running multiple CPU intensive tasks such as Object Cloning, Image Recognition, OCR, PDF Integration, and Terminal Emulation. that are CPU intensive, as multiple threads or processes to avoid blocking the main thread.

	Minimum	Recommended
CPU Cores	2 x 1.8 GHz 32-bit (x86)	4 x 2.4 GHz 64-bit (x64)
RAM	4 GB	8 GB
Disk Space	3.5 GB for new installations, 5 GB for upgrades (including temporary files required during installation)	N/A

Figure 1. Hardware Requirements

5. SYSTEM DESIGN

Systems design is the process of defining the architecture, modules, interfaces, and data for a system to satisfy specified requirements.

Elements of a System

- Architecture - This is the conceptual model that defines the structure, behavior and more views of a system. We can use flowcharts to represent and illustrate the architecture.
- Modules - These are components that handle one specific task in a system. A combination of the modules make up the system.
- Components - This provides a particular function or group of related functions. They are made up of modules.
- Interfaces - This is the shared boundary across which the components of the system exchange information and relate.
- Data - This is the management of the information and data flow.

5.1. RPA ARCHITECTURE

The architecture of Robotic Process Automation (RPA) is a combination of several tools, platforms, and various infrastructure elements to form a complete RPA tool.

Applications under Robotic Process Execution

RPA is well suited for enterprises and enterprise applications like ERP solutions (For example, SAP, Siebel, or massive data processing or records processing applications like Mainframes). Most of these applications are data-centric and also data-intensive with loads and loads of set up and repetitive process activities.

RPA Tools

Most of the critical capabilities that are expected to be available in any of the RPA tools are given

below:

- The ability to automate a variety of application environments such as Web, Desktop, and Citrix environments.
- The ability to develop software robots that understand by recordings, configuring and also enhancing these with programming logic (For example, loops and conditions).

- To be able to build reusable components which can further be applied to multiple robots, ensuring modularity and also faster development and also at the same time easier maintenance

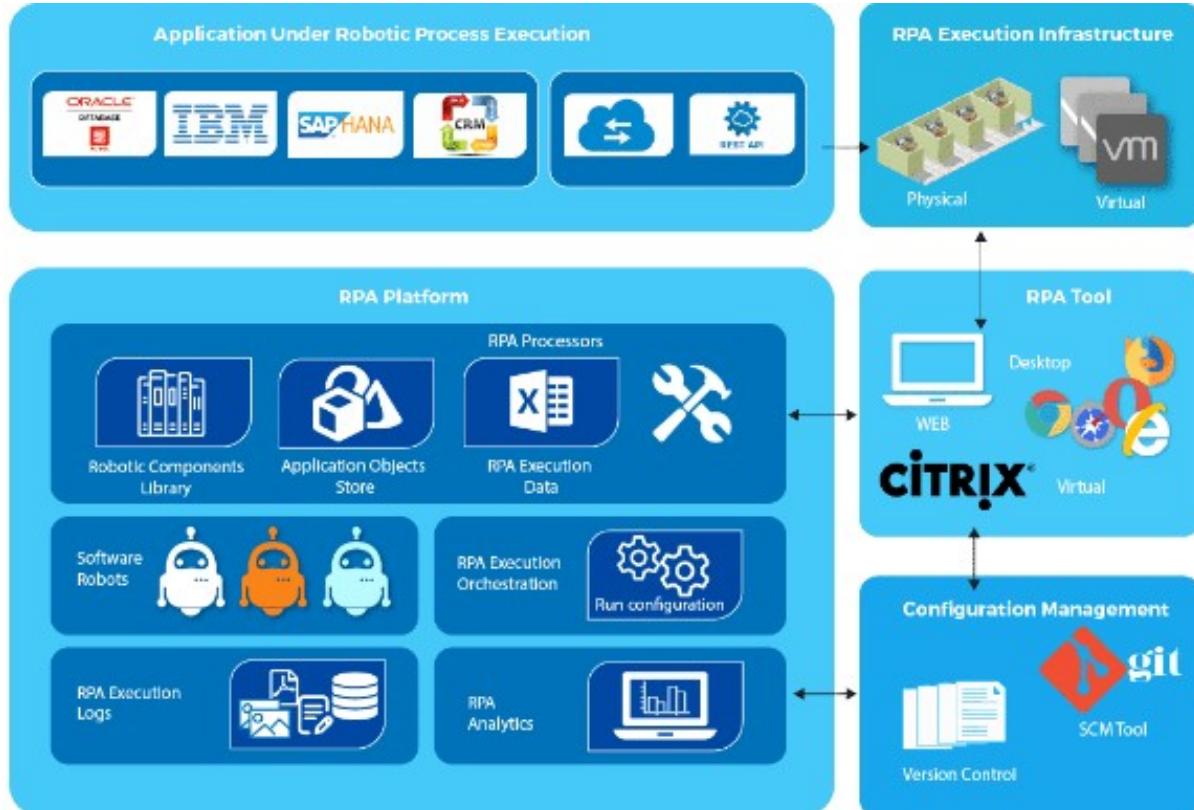


Figure 2. RPA Architecture

- To be able to build shared application UI object stores and also object repositories containing object locators
- The ability to read and write from/to various data sources while executing these software robots

5.2 UML DIAGRAMS

What is UML?

The Unified Modeling Language (UML) is a standard language for specifying, Visualizing, constructing and documenting the artifacts of software systems, as well as for business modeling and other non-software systems. The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems. The UML is a very important part of developing objects-oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects. Using the UML helps project teams communicate, explore potential designs, and validate the architectural design of the software.

Goals:

The primary goals in the design of the UML are as follows:

1. Be independent of particular programming languages and development processes.
2. Provide a formal basis for understanding the modelling language
3. Encourage the growth of the OO tools market.
4. Support higher-level development concepts such as collaborations, frameworks, patterns and components.
5. Integrate best practices

USE CASE DIAGRAM:

Use case diagrams are usually referred to as behavior diagrams used to describe a set of actions (use cases) that some system or systems (subject) should or can perform in collaboration with one or more external users of the system (actors). A use case is a methodology used in system analysis to identify, clarify and organize system requirements. The use case is made up of a set of possible sequences of interactions between systems and users in a particular environment and related to a particular goal. It consists of a group of elements (for example, classes and interfaces) that can be used together in a way that will have an effect larger than the sum of the separate elements combined. The use case should contain all system activities that have significance to the users. A use case can be thought of as a collection of possible scenarios related to a particular goal, indeed, the use case and goal are sometimes considered to be synonymous. The main purpose of a use case diagram is to show what system functions are performed for which actor.

SEQUENCE DIAGRAM

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario.

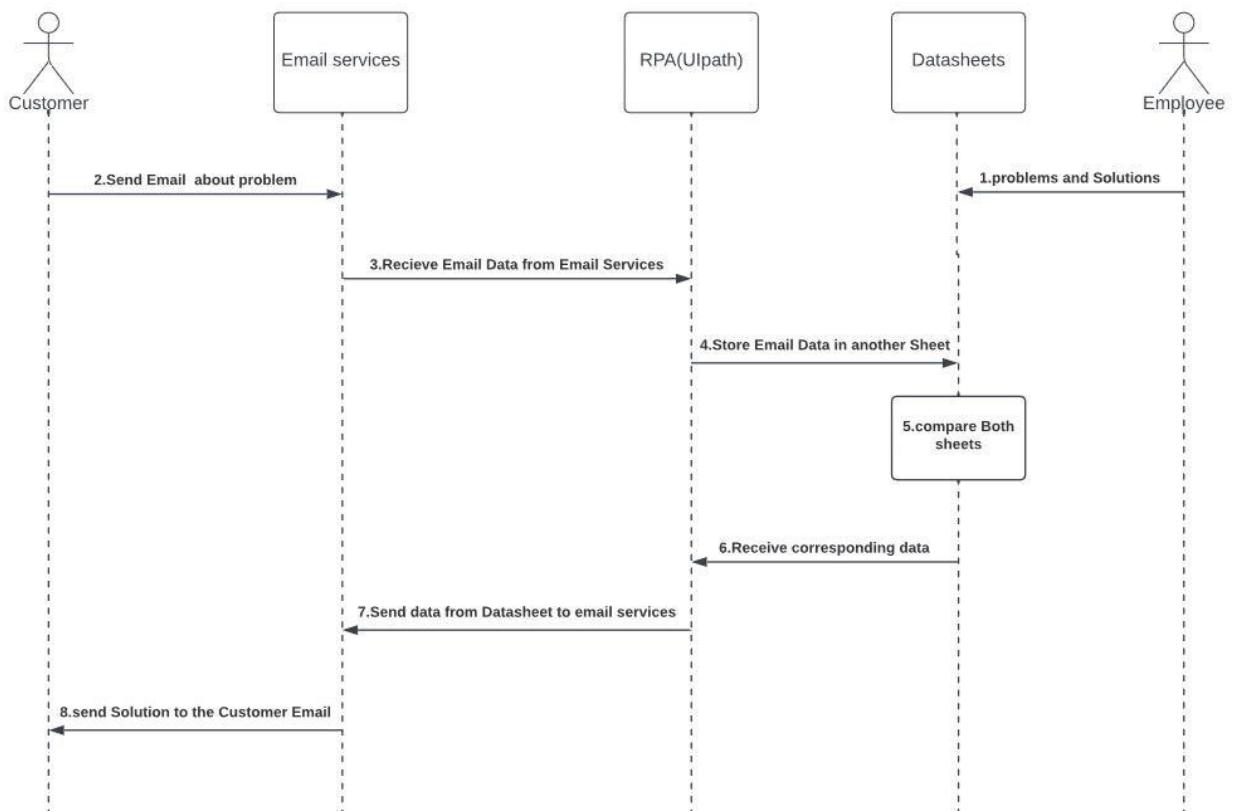


Figure 3 : Sequence diagram

Workflow Diagram

A workflow diagram (also known as a workflow) provides a graphic overview of the business process. Using standardized symbols and shapes, the workflow shows step by step how your work is completed from start to finish. It also shows who is responsible for work at what point in the process. Designing a workflow involves first conducting a thorough workflow analysis, which can expose potential weaknesses. A workflow analysis can help you define, standardize and identify critical areas of your process.

Workflows are also useful to help employees understand their roles and the order in which

work is completed, and to create more unity within different departments. Originating from the manufacturing industry, workflows are now used by a variety of industries—from government to finance to commerce.

- The client receives emails from the customers containing issues they have run into.
- The data is extracted from the email into an excel sheet
- The problems and solutions are compared and existing solutions are checked
- Once the corresponding solution is found it is automatically sent
- If not the reply is sent manually

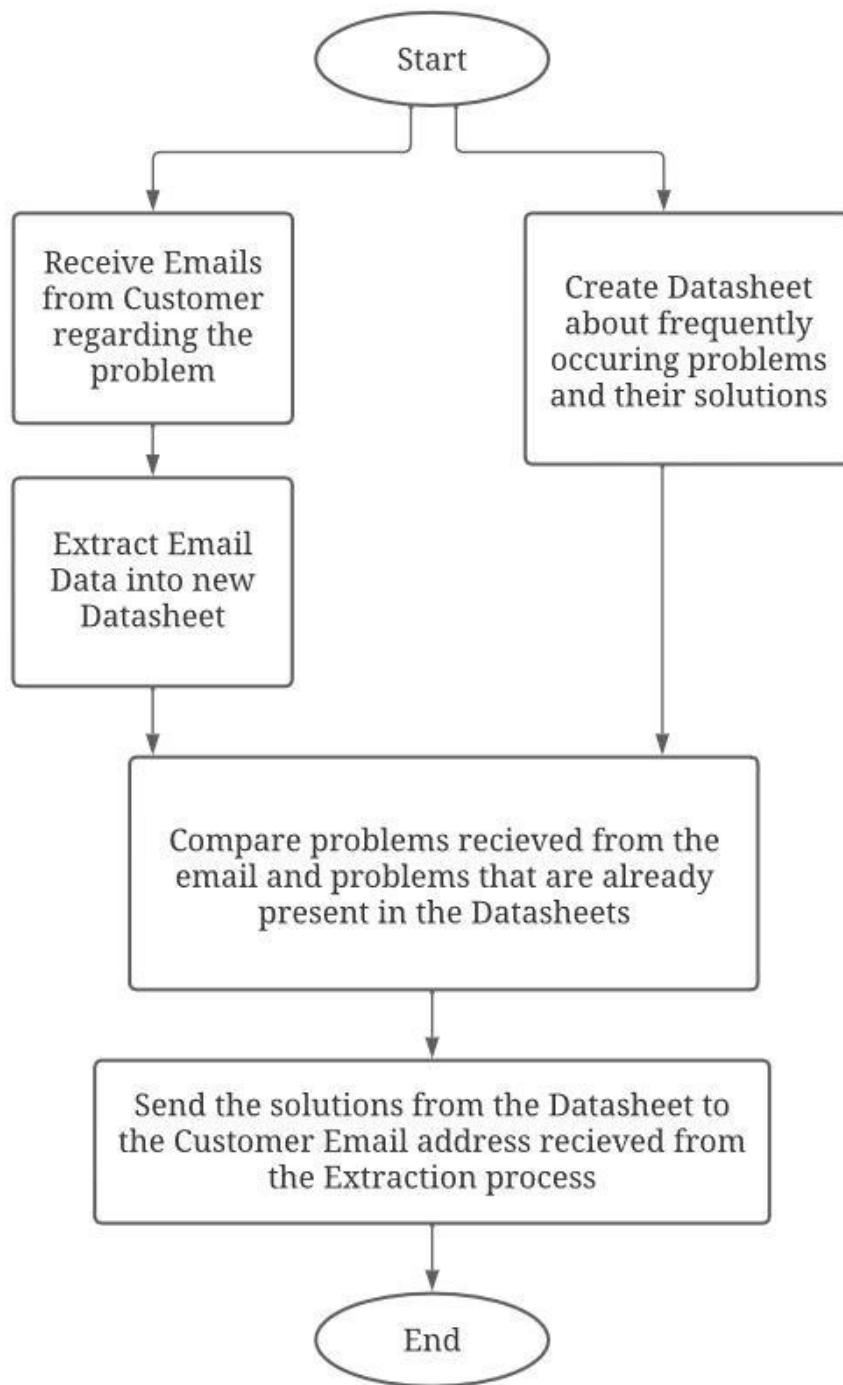


Figure 4 : Workflow Diagram

6.SYSTEM IMPLEMENTATION

6.1 INSTALLATION OF UIPATH

The UiPath Studio MSI installer enables you to install Studio, StudioX, Robot, and Assistant. Use the **Enterprise Edition** of the installer if your organization purchased the UiPath Platform or you are installing as part of a trial of the UiPath Platform. If you are a community user, use the **Community Edition** of the installer.

You can install on physical machines or virtual machines. To deploy Studio to multiple virtual machines, you can install it in a golden image.

The installer can be downloaded from the Resource Center in UiPath Automation Cloud or provided by your customer success manager or the support team. To request a trial, go to https://cloud.uipath.com/portal/_register.

By default, a 64-bit version of the installer is available (UiPathStudio.msi). There is a single installer, but the file name differs depending on the type of deployment and license, with each file offering a different activation experience.

For the Enterprise Edition, the installer is named as follows:

- UiPathStudio.msi - Obtained after purchasing the on-premises UiPath Platform.
- UiPathStudioCloud.msi - Obtained after purchasing UiPath Automation Cloud.
- UiPathStudioOnPremTrial.msi - Obtained as part of a trial of the on-premises UiPath Platform.
- UiPathStudioCloudTrial.msi - Obtained as part of a trial of UiPath Automation Cloud.
- For the Community Edition, the installer is named UiPath.StudioCommunity.msi.

For the Enterprise Edition, a 32-bit version that can only be installed on 32-bit operating systems is also available (-x86 is appended to the file name).

If you are running the installer to update from an older version:

- Use the 64-bit version of the installer (UiPathStudio.msi) to update existing 32-bit and 64-bit installations on 64-bit operating systems.
- Use the 32-bit version of the installer (UiPathStudio-x86.msi) to update existing installations on 32-bit operating systems.

You can perform the installation for the current user in a default configuration by selecting the **Quick** option in the installation wizard (no administrator privileges required) or configure the installation by selecting the **Custom** option (requires administrator privileges).

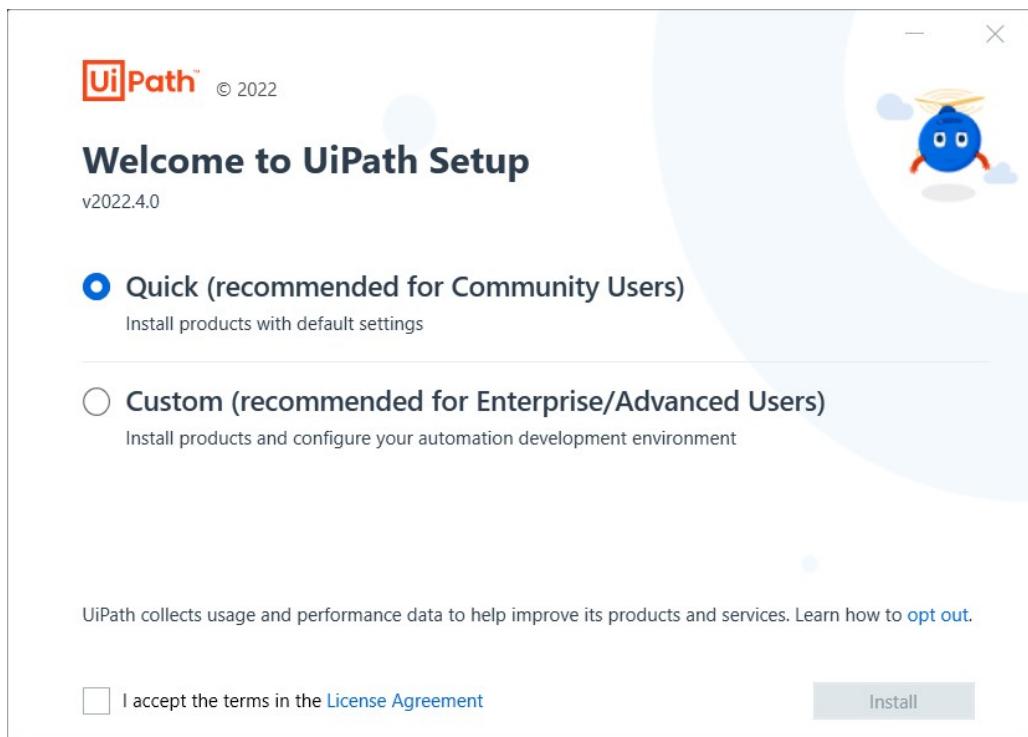
Automating Customer Support Tickets With RPA

	Quick	Custom
Supported robot installation types	User mode	- User mode for per-user installations. - User mode or service mode for per-machine installations ¹
Administrator privileges required for the installation	No	Yes
Installation available for	User who performs the installation	User who performs the installation or all users on the machine
Installation directory	%LocalAppData%\Programs	A custom location can be selected. The default location is: - %LocalAppData%\Programs for per-user installations. - %ProgramFiles% for per-machine installations.
Activation with Community license	Supported	Supported
Activation with Enterprise license	Supported	Supported
Administrator privileges required for connecting to Orchestrator	No	Required only for the service-mode robot
Connection to Orchestrator using interactive sign-in	Supported	Supported ²
Connection to Orchestrator using the machine key	Supported	Supported
Unattended execution without user login	Not supported	Supported only for the service-mode robot

Figure 5 : UiPath License

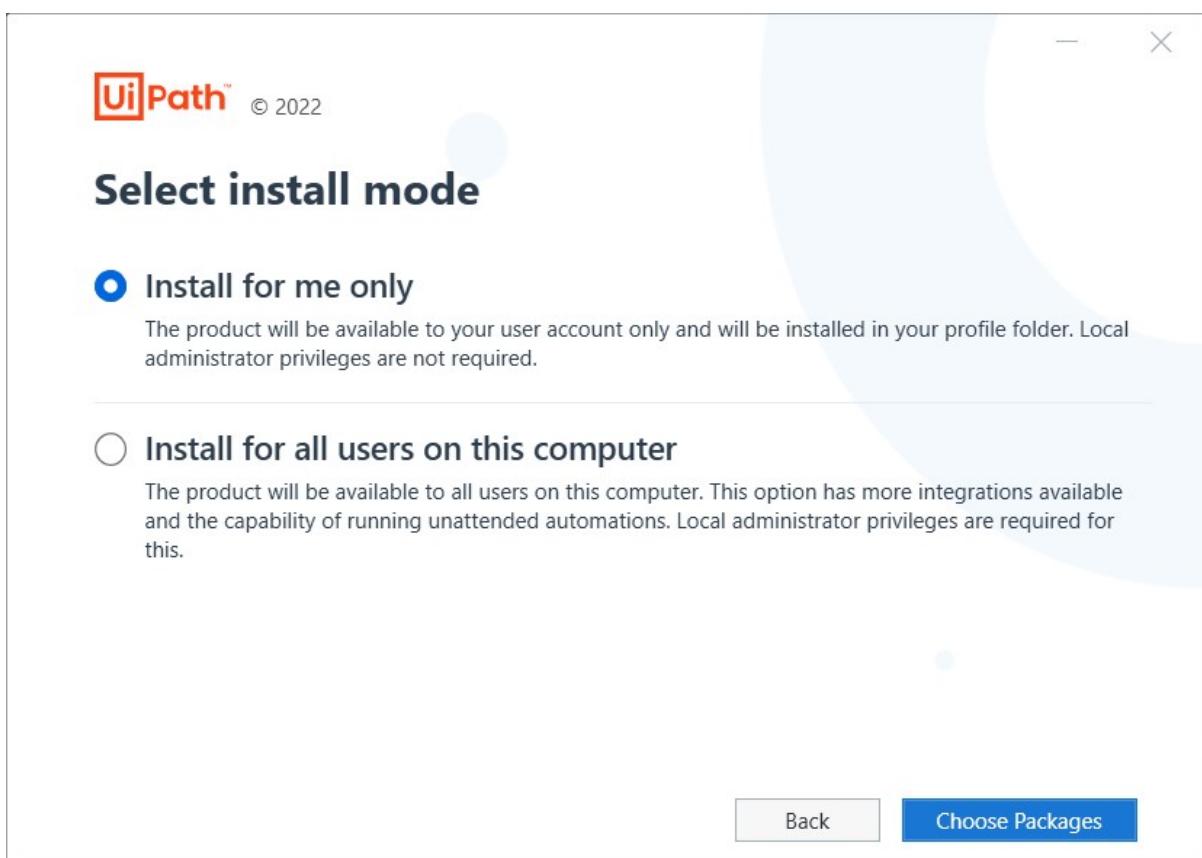
Performing the Installation

1. Double-click the installer to launch the installation wizard



2. Read and accept the License Agreement. Please note that by accepting the terms of the license agreement, you implicitly accept the terms of use of UiPath activity packages and their dependencies.
3. Select the type of installation to perform:
 - o Quick - Install Studio in a default configuration that includes the following:
 - Studio, StudioX and Assistant
 - User-mode Robot
 - StudioX Excel Add-in (if Microsoft Excel is installed on your machine)
 - Chrome extension (if Google Chrome is installed on your machine)
 - Edge Chromium extension (if Microsoft Edge Chromium is installed on your machine)
 - JavaScript Robot Add-on
 - Extension for Microsoft Remote Desktop

- The installation path (%localappdata%\Programs\UiPath) and all other advanced options are already configured to help you get Studio up and running right away. This setup does not require administrator permissions—Studio is installed per user and is limited to the rights that the user has.
- **Custom** - Select which components to install, and configure advanced installation settings. Select this option and click **Configure** to proceed. This is the recommended option for advanced and Enterprise users.
 - **Install for me only** - Install in the user profile folder, no administrator privileges required.
 - **Install for all users on this computer** - Install for all users, get access to more integrations and unattended automation, requires administrator privileges.

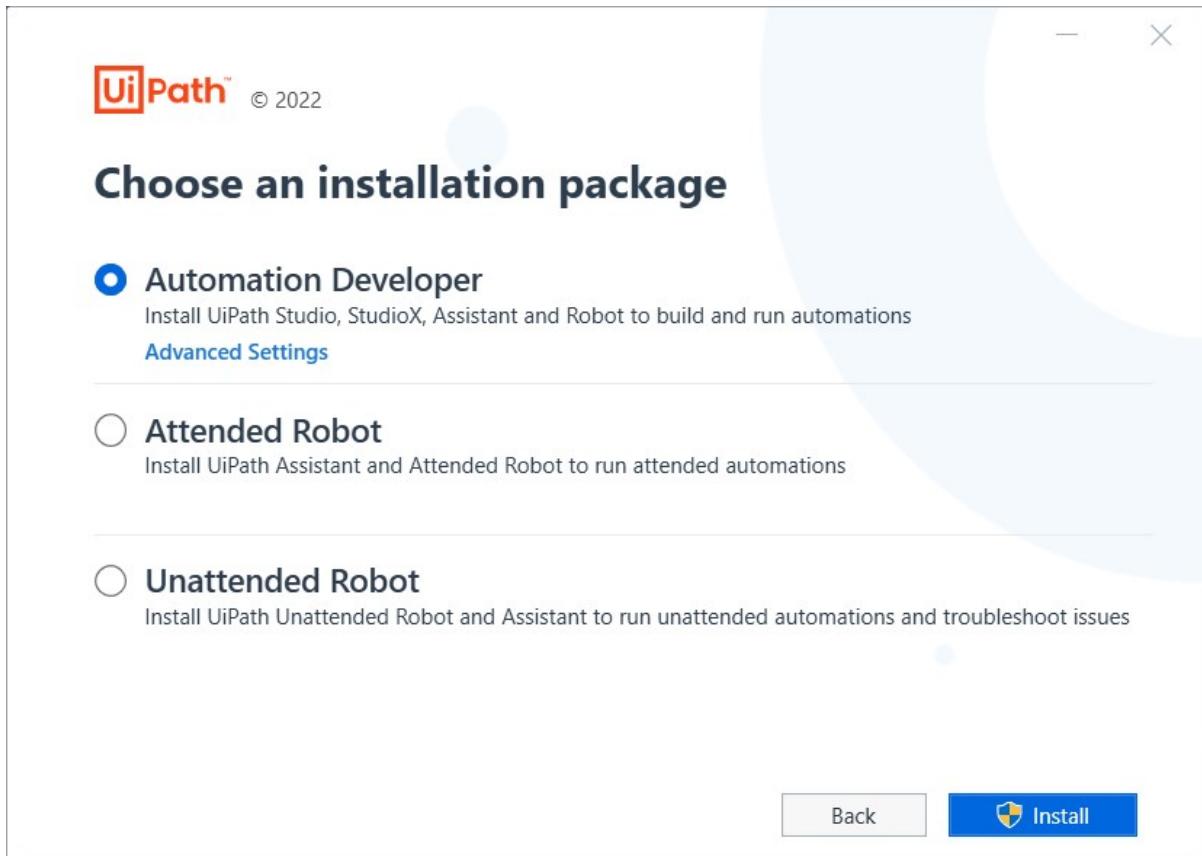


Select an installation package:

- **Automation Developer** - Installs UiPath Studio, Assistant, and Robot for creating and running automations. The following components and options are selected by default:
 - Studio, StudioX and Assistant
 - User-mode Robot
 - StudioX Excel Add-in (if Microsoft Excel is installed on your machine)
 - Chrome extension (if Google Chrome is installed on your machine)
 - Edge Chromium extension (if Microsoft Edge Chromium is installed on your machine)
 - JavaScript Robot Add-on
- **Attended Robot** - Installs UiPath Assistant and Robot for running attended automations. The following components and options are selected by default:
 - Assistant
 - User-mode Robot
 - Automatically Start Assistant with Windows
 - Chrome extension (if Google Chrome is installed on your machine)
 - Edge Chromium extension (if Microsoft Edge Chromium is installed on your machine)
 - JavaScript Robot Add-on
- Unattended Robot - Installs UiPath Robot for running unattended automations (via Orchestrator) and UiPath Assistant for troubleshooting. This option is available only if you selected to install for all the users on the machine.

The following components and options are selected by default:

- Assistant
- Service-mode Robot
- Chrome extension (if Google Chrome is installed on your machine)
- Edge Chromium extension (if Microsoft Edge Chromium is installed on your machine)



- To install the selected option using the default configuration, select Install and proceed to step 8. To customize the installation, select Advanced Settings next to the option you selected and proceed .
- If you opted to customize the installation, configure the following advanced settings, and then click Install:
 - Installation Package tab:
 - Installation Path - Select the folder where to install UiPath. The default location is %LocalAppData%\Programs when installing for the current user and %ProgramFiles% when installing for all users on the machine.
 - License Code - Optionally, enter your stand-alone trial or enterprise license key, if available. If you are installing as part of a trial of the on-premises UiPath Platform and do not enter a license code, you are prompted to provide it when you launch Studio for the first time. This option is available only when installing for all users on the machine.
 - Robot Installation Type - Select the Robot installation type: Service Mode (the recommended option for running unattended automations) or

User Mode (the recommended option for creating and testing automations, and running attended automations). For more details, see [Robot types](#) in the Robot guide. This option is available for the Automation Developer and Attended Robot packages when installing for all users on the machine.

- Orchestrator Service URL - Allows you to define the URL of the Orchestrator instance to connect to using [Interactive Sign-In](#). The provided URL is saved in the uipath.config file. This option is available only if you selected the User Mode installation type.
- Automatically Start Assistant with Windows - Launch the Assistant at Windows startup. This option is available for the Automation Developer and Attended Robot packages when installing for all users on the machine.

6.2 SETTING UP THE FOLDER STRUCTURE

The folder structure has to be set up in the UiPath folder.

Create a folder in My Documents that contains all the Excel sheets and the UiPath program.

	Name	Date modified	Type	Size
	Customer Support Tickets	17-06-2022 05:40 PM	File folder	
	mailail	17-06-2022 05:39 PM	File folder	
	Mail.xlsx	17-06-2022 05:49 PM	Microsoft Excel W...	12 KB

Store the UiPath file in the same location

	Name	Date modified	Type	Size
	.entities	13-06-2022 11:30 AM	File folder	
	.local	17-06-2022 05:49 PM	File folder	
	.objects	17-06-2022 05:40 PM	File folder	
	.settings	17-06-2022 05:40 PM	File folder	
	.templates	17-06-2022 05:40 PM	File folder	
	.tmh	17-06-2022 05:40 PM	File folder	
	Main.xaml	17-06-2022 05:49 PM	Windows.XamlDo...	17 KB
	project.json	13-06-2022 12:48 PM	JSON File	2 KB
	Sequence.xaml	13-06-2022 05:48 PM	Windows.XamlDo...	4 KB

Figure 6 : Project Folder Structure

6.3 ARRANGE THE INPUT FILES

Gather and prepare input files in the required formats for using in the process of development and testing

6.4 EMAIL SETTINGS

Click on the Tools menu, and select Options. In the Email Settings, type a Host Name and Port:

- Host: The SMTP Host enables users to send email from UiPath. This information is either obtained from the email provider, or from the configuration settings in the email program
- Port: This setting defines the TCP/IP port that UiPath uses to send email

Server	Host Name	Supported Ports
Outlook/Office 365	smtp-mail.outlook.com	25, 587

6.5 DEVELOPING THE BOT USING UIPATH

Note:

While developing the bots in UiPath we have to login with Bot creator credentials.

Task Editor components

The Task Editor provides the following user interface components:

- Drag and drop Commands panel
- Task Actions List in Design view, Code view, or both.
- Action buttons
- Variable Manager panels
- Filters
- Search capabilities

Using Commands panel

The left panel contains all of the UiPath supported automation process commands to build and enhance automation tasks. Drag and drop these commands into the Lines panel, move commands, and edit commands in bulk, if required.

Using actions buttons

- New sequence to create a new task

- Run button to run the current task
- Save button to save the current task

COMMANDS USED IN BOT:

Send Email command

Using the send outlook mail message, users can:

- Send multiple emails at the same time.
- Include attachments with the email
- Format the message

Use Multiple Assign

Using the multiple assign, users can:

- Assign variables to grab data
- Assign multiple variables

Use for each row in data table

Using the for each row in data table, users can:

- Create loops with specific conditions
- The loop can be used to perform certain operations

7.TESTING

7.1.INTRODUCTION

Bot tasks should be fully tested. A required step in bot development is testing. Fully test all bot tasks before they are deployed to production. The goal is to identify and correct known errors, and prevent unexpected events from causing the bot to fail. If a bot does not pass testing:

- Correct the error
- Put error handling processes in place

At a broader level RPA testing can be grouped into 2 categories. First one is testing the business processes automated through RPA and the second one is testing the instructions passed on to Robots to execute user actions.

Business process testing

This is nothing but the conventional testing done for any application. The end to end business process automated by the RPA tool has to be validated here. If we have to test the RPA use case example mentioned above, a scenario would be to test if Robot is able to get the file from the server, read the data from application, compare these two data sources, identify any conflicts and send an email notification to respective owner. All combinations of data are to be validate like it is done for any other application

Robots testing

There are multiple aspects when testing Robots. The first one is interpretation of the models by Robots. It is very important that the Robots are able to interpret the instructions given through the models correctly and able to perform actions on the UI accordingly. This need not be tested regularly but when the model is designed/modified or before a Robot is put into use. There can be situations where the model itself may not be changed but the attributes of elements may be updated. Even in such scenarios it is important test if the Robots are working as intended

Second aspect is to test if the scheduling of the Robots is working as intended. This need not be done if the invocation of Robots is scheduled from RPA tools but if the Robots are invoked through an external program, it becomes important to verify if the scheduling is working. In some cases the Robots may be invoked based on certain events. Tests should cover this type of situations as well

Third aspect is exception handling. Instructions are given to Robots for handling exceptions. It is important to test if these exceptions are handled correctly and consistently

Fourth aspect is performance. Though there may not be any SLAs around the time these Robots could take to automate business processes, it is important to verify if the Robots are able to complete the business process within acceptable limits

Fifth aspect is web services. In some situations some part of the models are exposed as web services. It is also important to test if these web services are working as intended

7.2 PERFORMANCE TESTING

Performance testing checks the speed, response time, reliability, resource usage, scalability of a software program under their expected workload. The purpose of Performance Testing is not to find functional defects but to eliminate performance bottlenecks in the software or device.

The focus of Performance Testing is checking a software program's

- Speed - Determines whether the application responds quickly
- Scalability - Determines maximum user load the software application can handle.
- Stability - Determines if the application is stable under varying loads

The key elements of the performance testing should focus on.

1. Capacity related issues when concurrent jobs are scheduled by robots
2. Tasks completed in given time per bot
3. Licensing and bot utilization –
 - i. Licenses - Monitors total number of acquired robot licenses
 - ii. Robot utilization vs. capacity - Monitors the percentage of acquired robot licenses that are utilized in production
4. hourly/daily variability in robot usage
5. Elastic Scalability - Dynamically upscaling and downscaling hundreds of robots to ensure RPA meets user demands
6. Complete eco system performance - Along with RPA processes, we need to focus on each application in the ecosystem.

Challenges Faced:

While now we understand what should be focus areas, there are inherent performance testing challenges faced by RPA. They are –

1. Dissimilar technologies
2. Performance testing tools availability
3. Test environment
4. Monitoring solutions
5. Continuous delivery pipeline
6. Unavailability of RPA backend / interacting systems

7.3. USER ACCEPTANCE TESTING

User acceptance testing, a testing methodology where the clients/end users involved in testing the product to validate the product against their requirements. It is performed at client location at developer's site.

For industries such as medicine or aviation industry, contract and regulatory compliance testing and operational acceptance testing is also carried out as part of user acceptance testing. UAT is context dependent and the UAT plans are prepared based on the requirements and NOT mandatory to execute all kinds of user acceptance tests and even coordinated and contributed by the testing team

Here the requirement is that , when an email is sent the data must be grabbed and stored in an excel sheet, if a solution already exists to the problem sent then it must be replied to through an email containing the solution.

7.4. AGILE TESTING

Most of the RPA development processes follow the Agile process. Agile testing is a testing practice that follows the rules and principles of agile software development. Unlike the Waterfall method, Agile Testing can begin at the start of the project with continuous integration between development and testing. Agile Testing is not sequential (in the sense it's executed only after (coding phase) but continuous.

7.5. UNIT TESTING

Unit testing is a type of software testing where individual units or components of a software are tested. The purpose is to validate that each unit of the software code performs as expected. Unit Testing is done during the development (coding phase) of an application by the developers. Unit Tests isolate a section of code and verify its correctness. A unit may be an individual function, method, procedure, module, or object.

Unit testing of RPA contains Unit testing of RPA contains

- Bot id Testing - How Bot id is performing and bot Application access and bot behaviours.
- Application behaviour testing using Bot - How Application is behaving through bot.
- Access Testing -What are all the Application can access through the Robot.
- Test Scenario based Testing
- Security testing -Credential vault testing Symantec check
- Control room/System Manager based Testing
- Bot scheduling level test
- Bot secure content reader test
- Bot read/Write access test
- Bot Environment Variable/Share drive/share folder mapping level test
- Bot input/output validation test
- Application level Login/Logout level test
- Bot config file validation /Email sending or receiving level test
- Bot Task level/subtask level test
- Bot behavioral testing.
- Bot Serverdown/Server up/Clustering level test
- Database Archiving test
- Database Table purge level test
- Initial level bot ID test.
- Log Description/ Logging level testing.

8.SOURCE CODE

UiPath integrates Microsoft Outlook in UiPath Studio. This means there are activities integrated that help you with the **email automation** when you are using the **Outlook application**.

Before starting the automation, we need to make sure that we are logged in to Outlook. It is not necessary to have the application open while performing the operation.

These are the activities that UiPath provides for Outlook :

- ▷ Favorites
- ◀ Available
 - ◀ App Integration
 - ◀ Mail
 - ◀ Outlook
 - ✉ Get Outlook Mail Messages
 - 📁 Move Outlook Mail Message
 - ✉ Send Outlook Mail Message

- **Get Outlook Mail Message**

This activity grabs your emails from the Outlook application and adds them to a list. The properties of this activity are given below

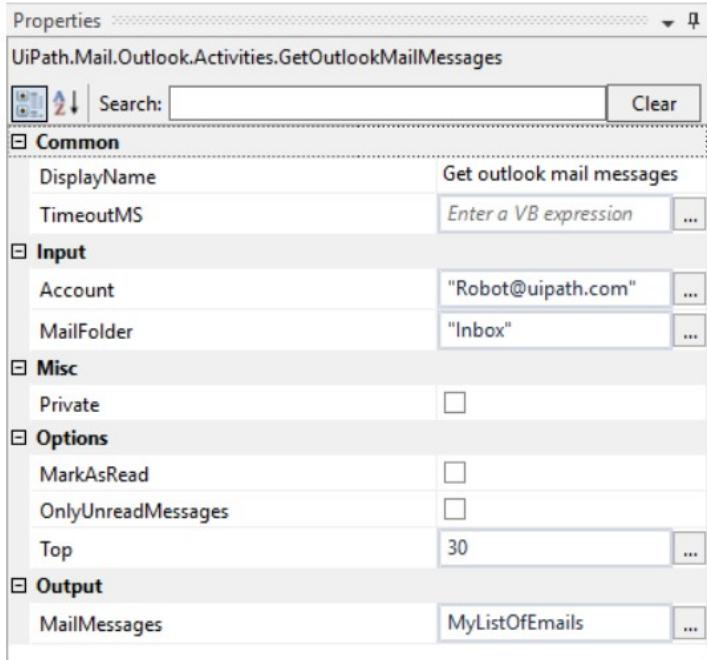


Figure 7 : Get Outlook Mail Message Activity

The most important are Account, MailFolder, Top and MailMessages. Without these properties the activity will not work.

Input:

- **Account:** Insert your email address.
- **MailFolder:** Generally, you will grab your emails from "Inbox", but you could also place there any folder from your Outlook application.

Output:

- **MailMessages:** The easiest way is to press right click in the blank space (or Ctrl+K) to create the output variable which is a list of MailMessages.

Options:

- **MarkAsRead:** If you grab some emails that were not read, these will be checked as read in Outlook.
- **OnlyUnreadMessages:** Check this option to get only the emails that were not read.
- **Top:** Indicate the number of emails you want to extract.

- **Move Outlook Mail Message**

This activity will move an email to a specified folder.

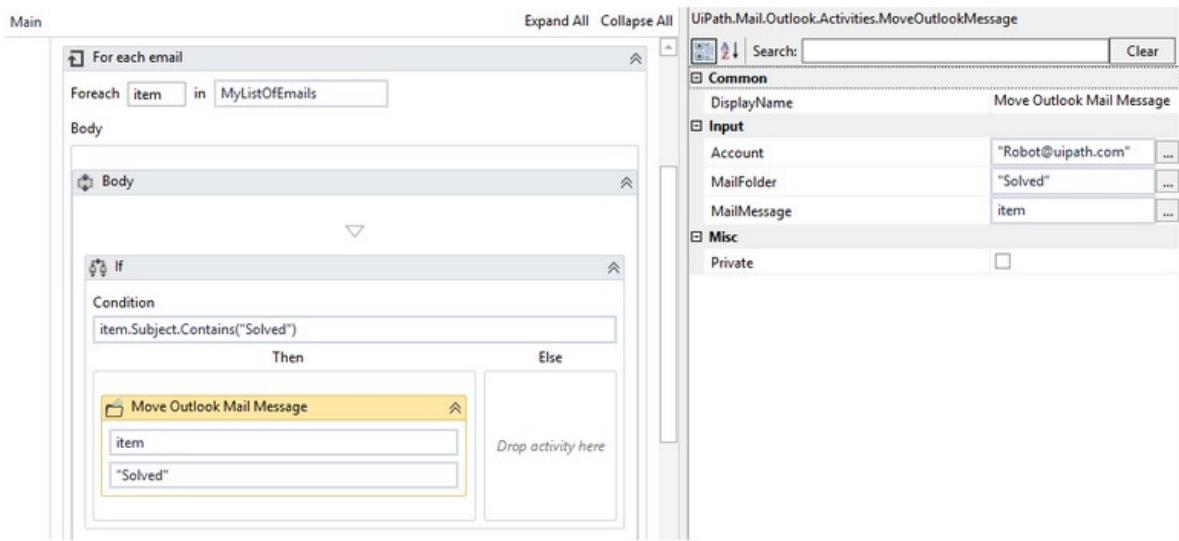


Figure 8 : Move Outlook Mail Message

In this situation we will go through the list of emails that we managed with the previous activity and if the email's subject contains the word "Solved", we move that email in the "Solved" folder.

- **Send Outlook Mail Message**

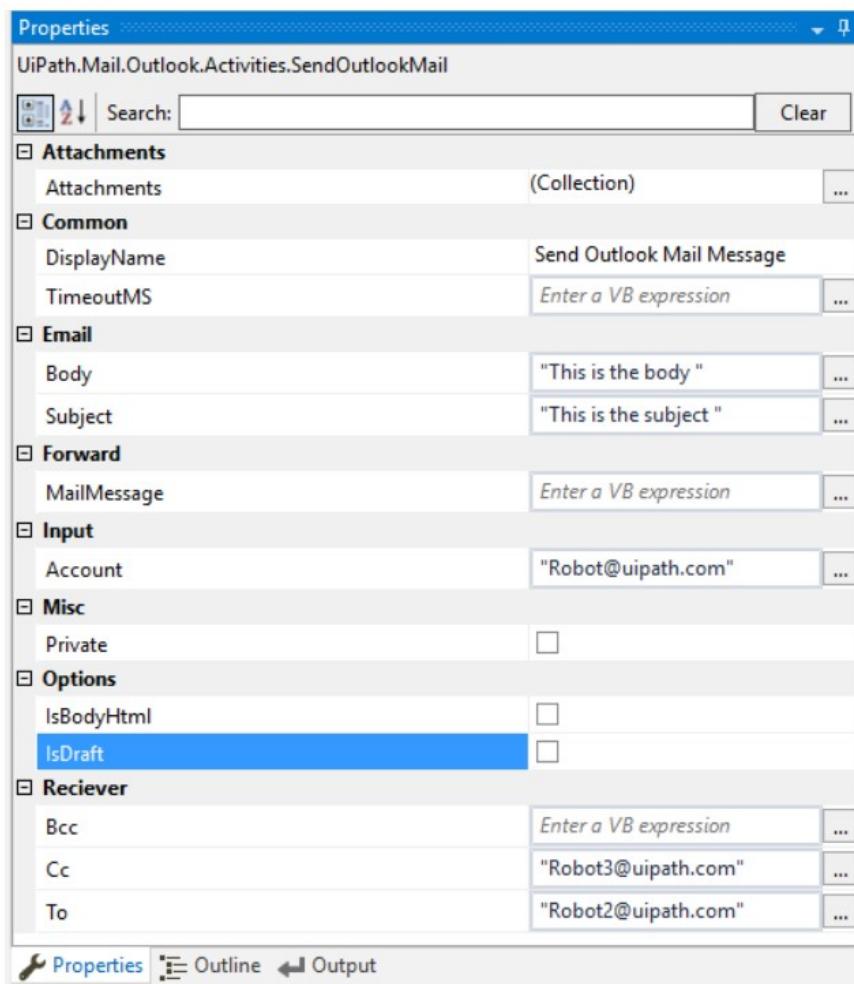
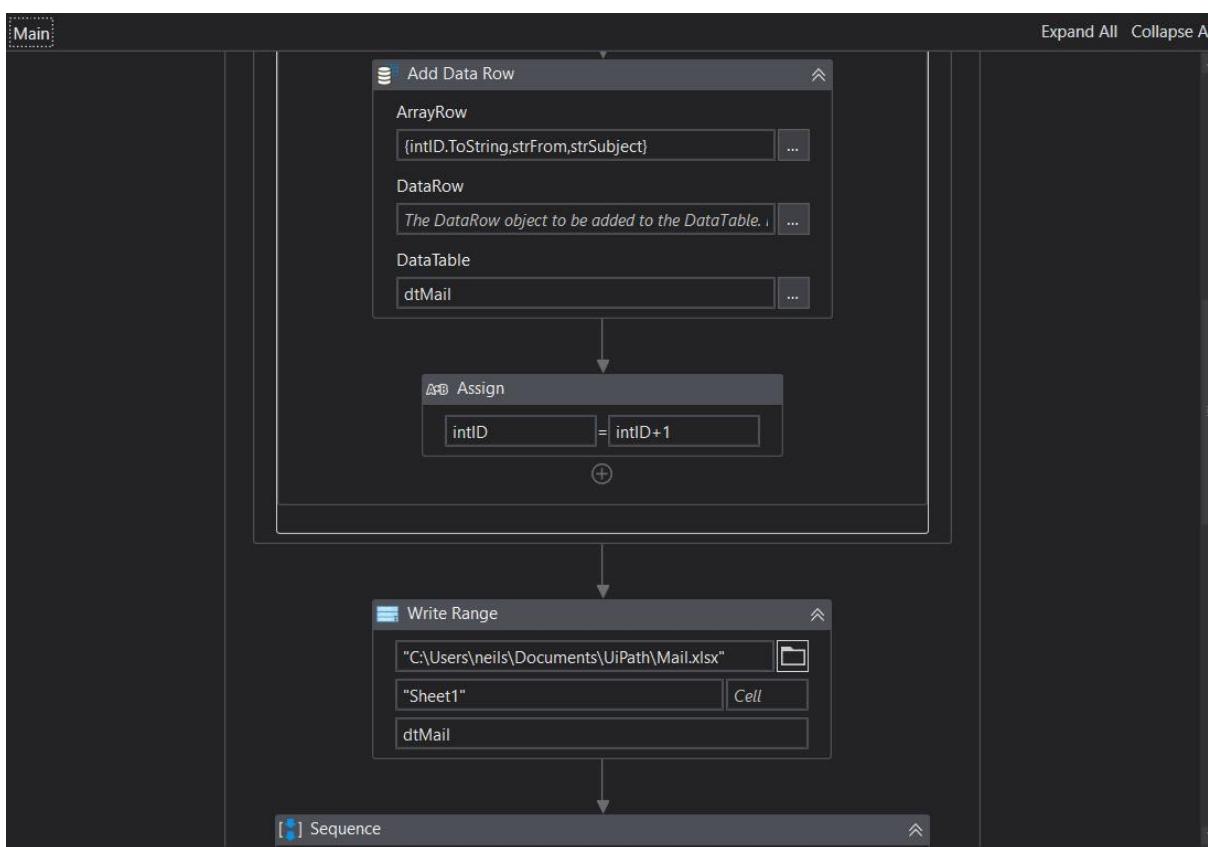
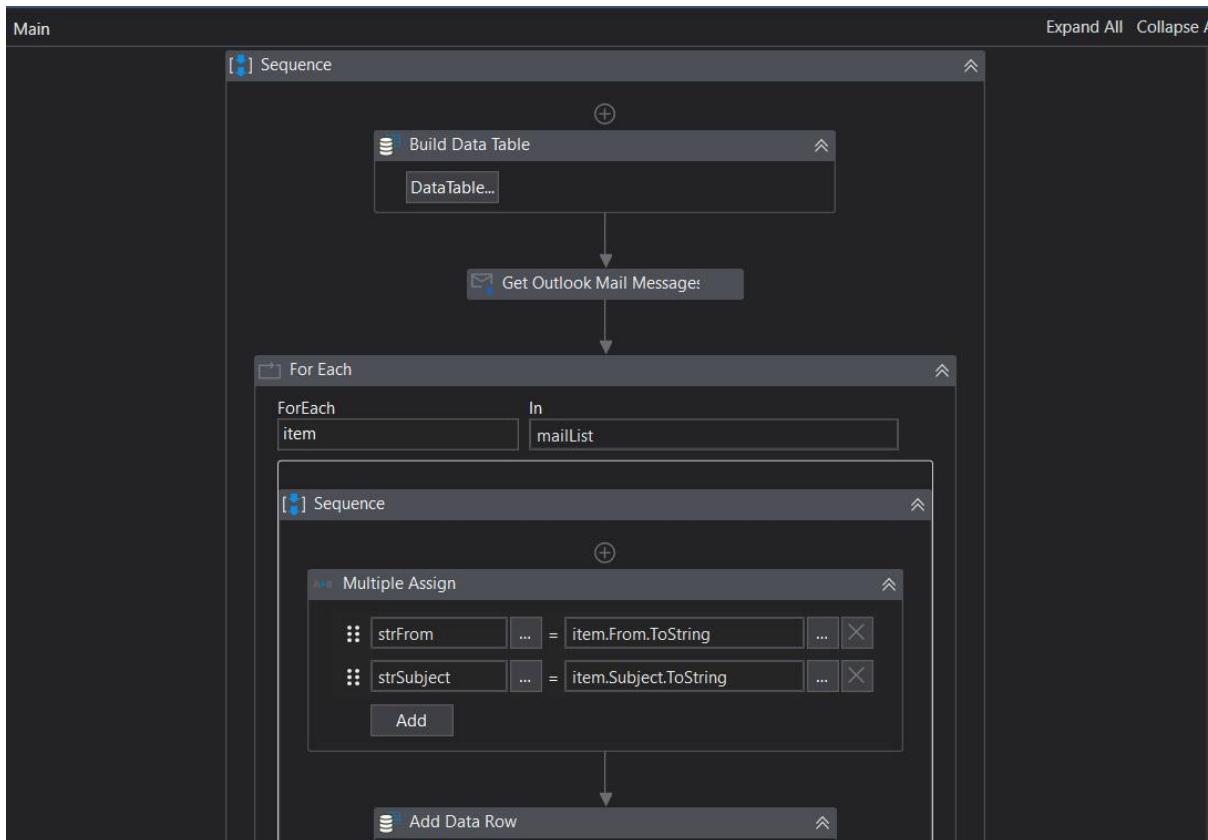


Figure 9 : Send Outlook Mail Message

By using the "SendOutlookMailMessages" activity, you are able to send an email from UiPath Studio.

- **Body:** Fill in the blank space with the body of the email you want to send.
- **Subject:** Fill in the blank space with the subject of the email you want to send.
- **MailMessage:** If you already have a MailMessage object, you can forward that email without completing the subject and the body.
- **Account:** Insert your email address. This is considered as the sender address.
- **CC:** Insert here the addresses that you want to include in the 'Cc.' If you have more than one address, type them separated by comma.

Automating Customer Support Tickets With RPA



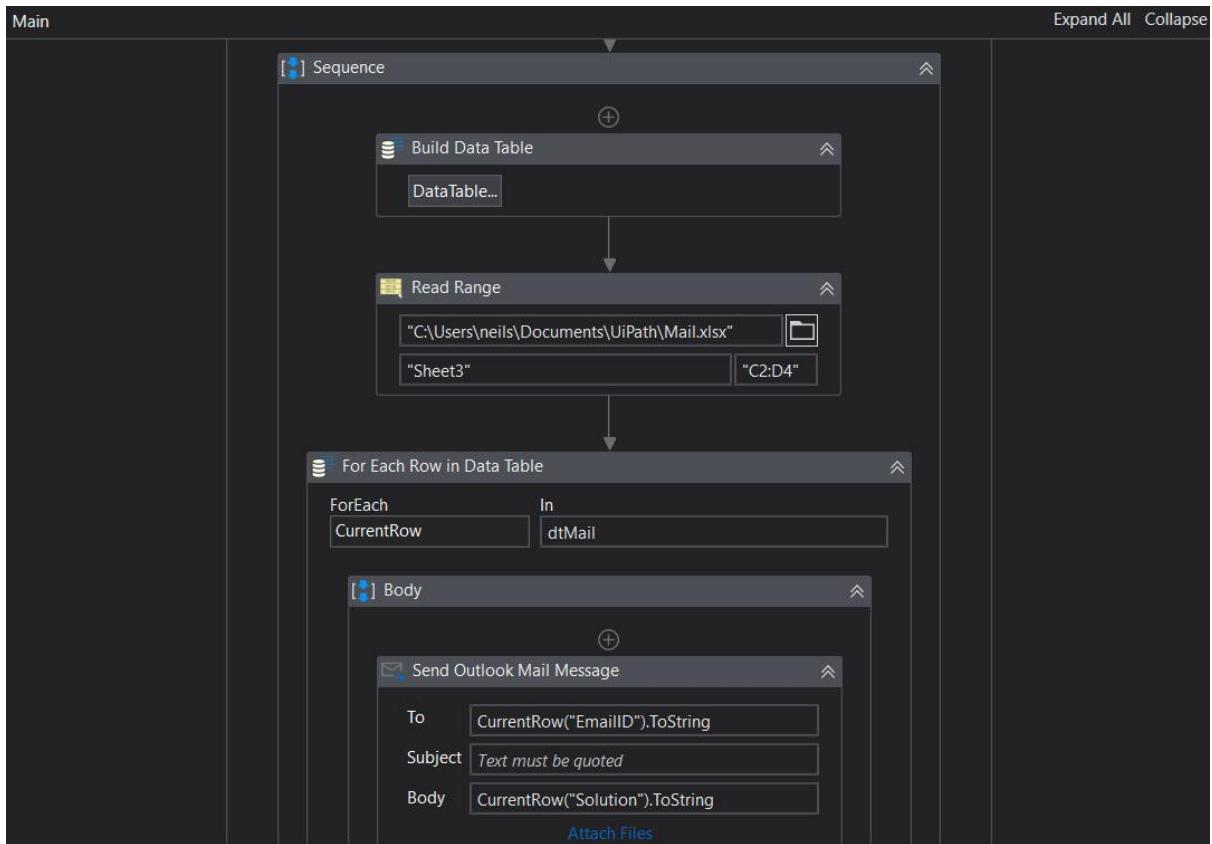


Figure 10 : Project code

- **Build Data Table**

Source of the activity : `UiPath.Core.Activities.BuildDataTable`

Activity Body

Clicking the **DataTable** button in the activity body opens the **Build Data Table** window, which enables you to customize the table to be created.

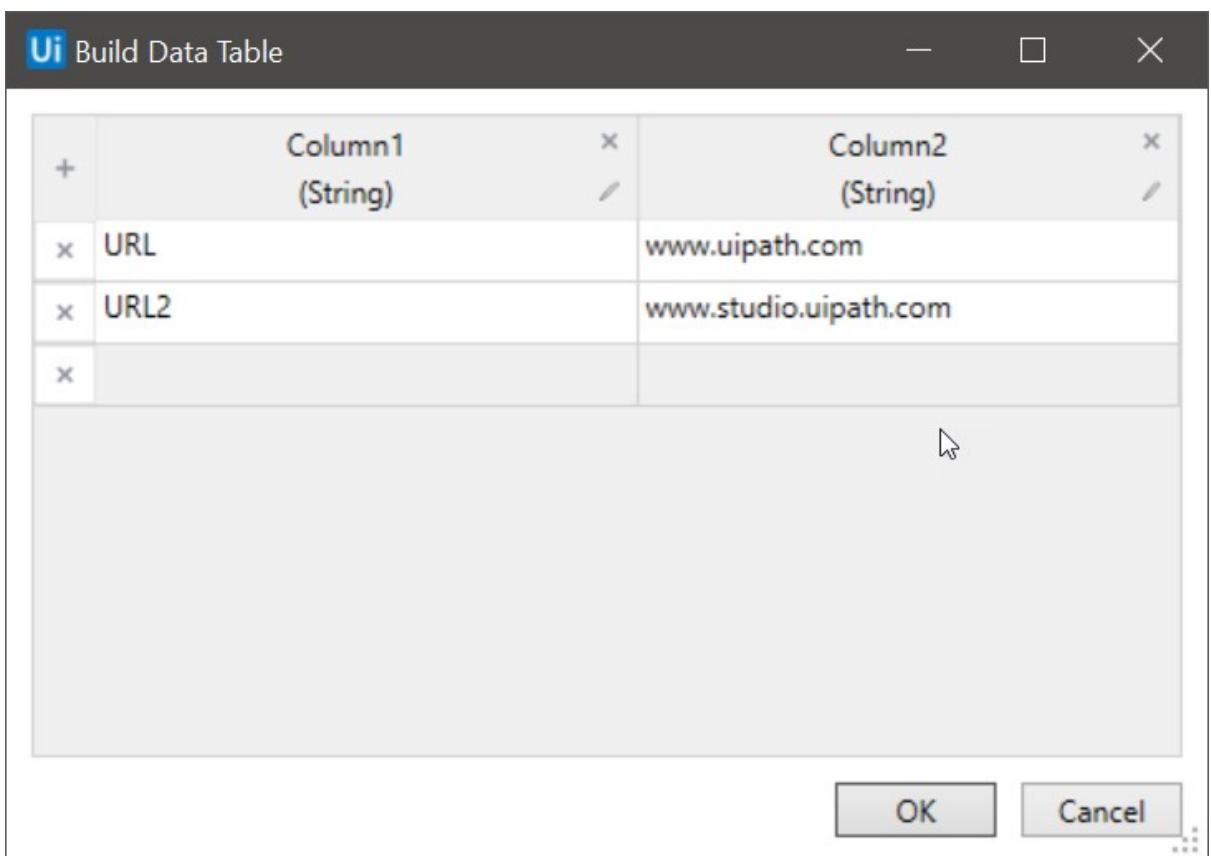
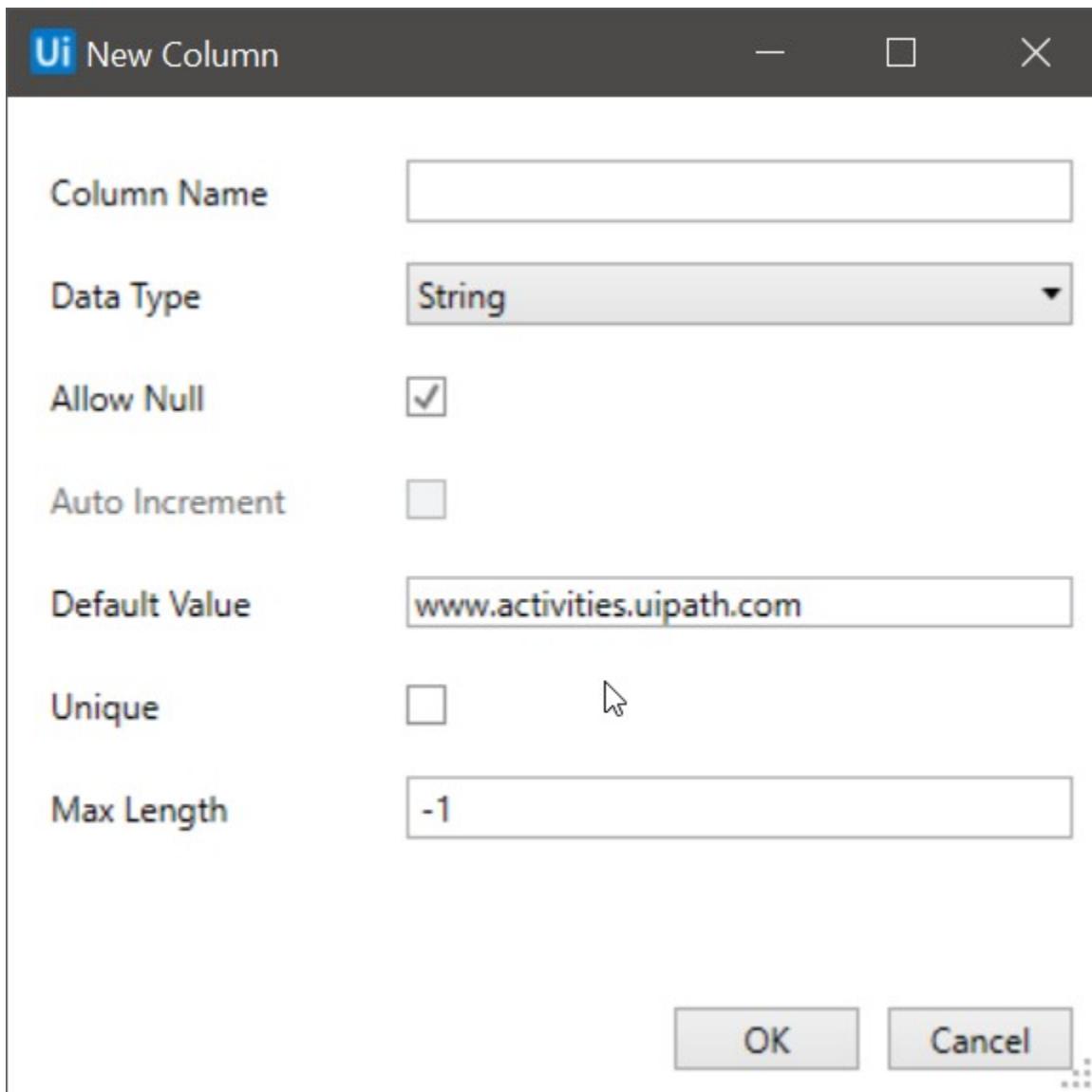


Figure 11 : Build DataTable

By default, two columns and two rows are displayed. The first row contains some values that can be edited. The second row cannot be removed, but it is not displayed in the output table.

Clicking the **Add Column** button opens the **New Column** window. It helps you create and customize each new column you want to add to the data table. After creating a new column, you can edit its properties by clicking the **Edit Column** button.

Changing the data type of a column erases all data in that column.



It contains the following fields:

- **Column Name** - The title of the column. This field supports only strings.
- **Data Type** - The type of values that the new column is going to accept.
- **Allow Null** - If this check box is selected, null values can be added to the rows of this column.
- **Auto Increment** - The check box is displayed only if the **Data Type** is set to Int32. If selected, the value of this column is automatically incremented by 1 every time a new row is added.
- **Default Value** - The default value of all the rows that are to be added to this column.
- **Unique** - If selected, all the rows in this column need to have unique values.

- **MaxLength** - The maximum number of characters accepted for this column. If you do not want to enforce a maximum length, the default value is -1.

Properties

Output

- **DataTable** - A DataTable variable that stores the information added in the **Build Data Table** window.

Common

- **DisplayName** - The display name of the activity.

Misc

- **Private** - If selected, the values of variables and arguments are no longer logged at Verbose level.

FOR-EACH ACTIVITY

Source of the activity : UiPath.Core.Activities.ForEach

The For Each activity enables you to step through arrays, lists, data tables or other types of collections, so that you can iterate through the data and process each piece of information individually.

Performs an activity or a series of activities, specified in the **Body** section, on each element of a collection. The elements can be referenced in the activities in the **Body** section by using the iterator variable, item.

Properties

Common

- **DisplayName** - The display name of the activity.

Misc

- **Private** - If selected, the values of variables and arguments are no longer logged at Verbose level.
- **TypeArgument** - A drop-down list that enables you to choose what variable type you want to use with the activity.
- **Values** - The variable whose values you want to iterate. This field supports only IEnumerable variables.

Output

- **Index** - A zero-based index that specifies which element of the current collection is being iterated, stored in an Int32 variable.

Example of Using a For Each Activity

To exemplify how to use a For Each activity, let's create an automation that goes through each element of an array of integers and writes the length of the array and each element to the Output panel.

1. Create a new sequence.
2. Create an array of integer variables, FibonacciNumbers.
3. In the **Default** field, type the Fibonacci sequence up to a desired value, such as {1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89}.
4. Add a **For Each** activity in the **Designer** panel.
5. Do not make any changes to the **ForEach** field.
6. In the **In** field, add the FibonacciNumbers variable. This activity looks at each individual item in the provided variable.
7. In the **Body** section of the **For Each** activity, add a **Write Line** activity.
8. In the **Text** field, type "The length of this Fibonacci sequence is " + FibonacciNumbers.Length.ToString + " and contains the " + item.ToString + " element.". This expression enables you to write the total number of array elements and each element of the array in the **Output** panel.
9. Press F5. The automation is executed. Note that the **Output** panel displays the correct message for each element of the array.

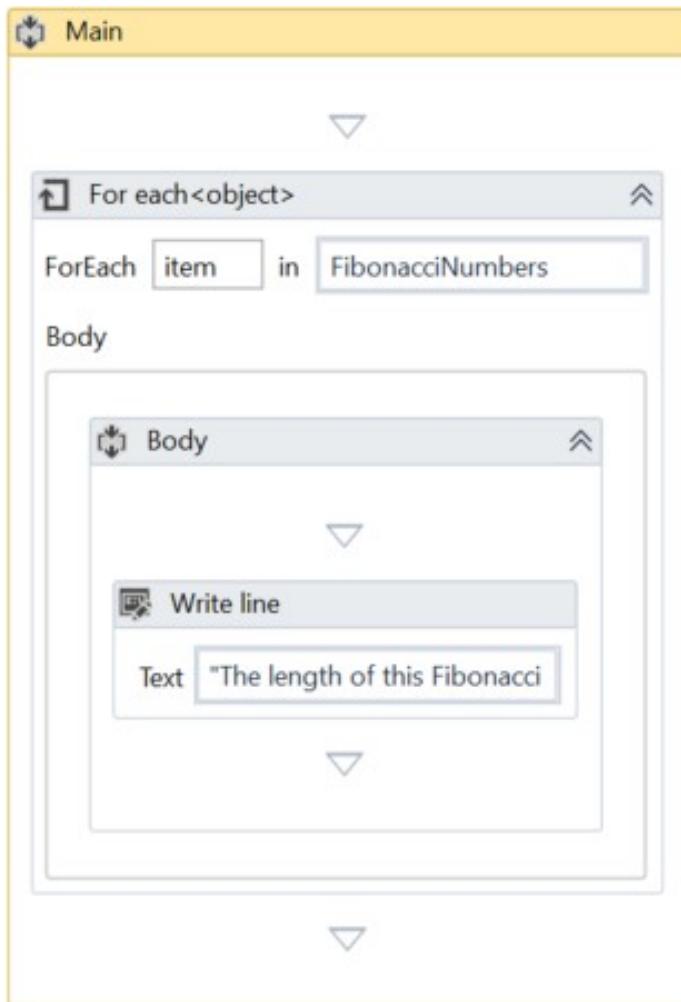
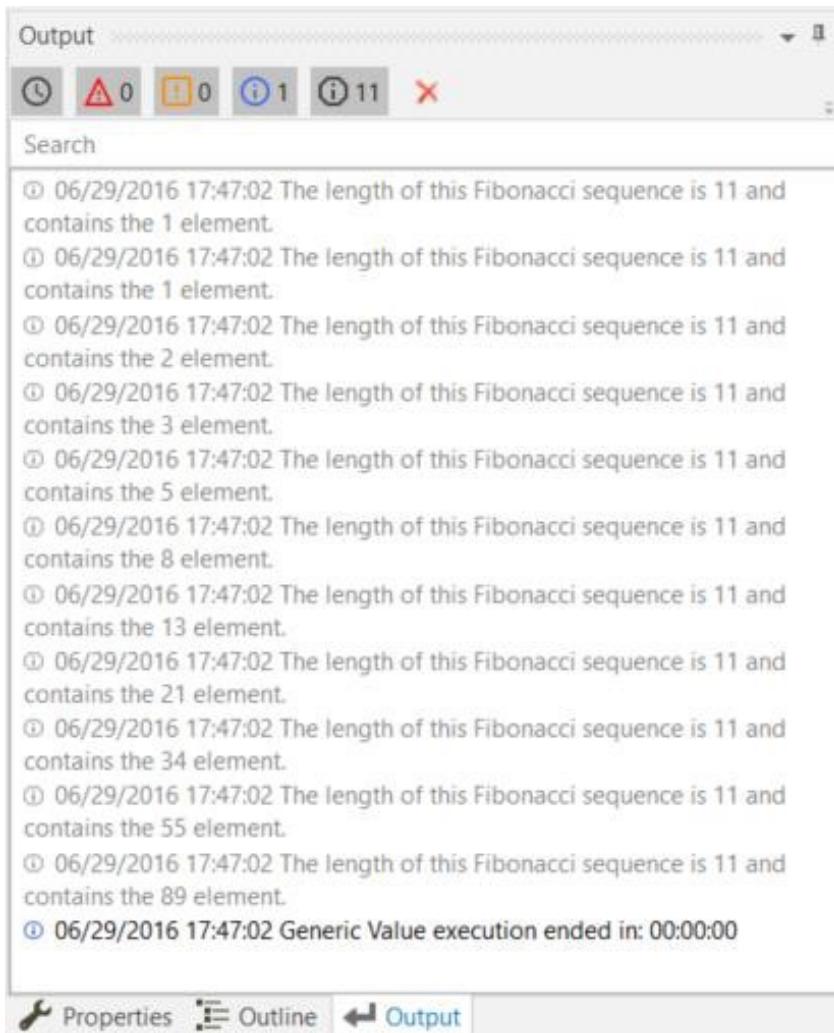


Figure 12 : For Each Activity

The **Length** property enables you to find out the total number of array elements.

Output for the example FOR EACH Activity



Sequences

Sequences are the smallest type of project. They are suitable to linear processes as they enable you to go from one activity to another seamlessly, and act as a single block activity.

One of the key features of sequences is that they can be reused time and again, as a standalone automation or as part of a state machine or flowchart.

For example, you can create a sequence to take information from a .pdf file and add it to a spreadsheet, and reuse it in a different setting, while changing just a few properties.

whenever you wish to copy a large number of activities from one sequence to another, it is recommended to scroll down to the bottom of the Designer panel beforehand. This is due to a Windows Workflow Foundation limitation.

Sequences do not use connectors.

Example of a Sequence

To create a sequence that asks the user for his first and last name, and his hair color, and then displays his answers, do the following:

1. Create a blank process and, on the **Design** tab, in the **File** group, select **New > Sequence**. The **New Sequence** window is displayed.
2. In the **Name** field type a name for the automation, such as "First Sequence", and leave the default project location or add a subfolder. Click **Create**. The **Designer** panel is updated accordingly.
3. Create three **String** variables such as FirstName, LastName, and HairColor, so that you can store data from the user in them. Leave the **Default** field empty, to indicate that there is no default value.
4. Drag three **Input Dialog** activities to the **Designer** panel, one under the other.
5. Select the first **Input Dialog** and, in the **Properties** panel, add a **Label** asking for the first name of the user, and a custom **Title**.
6. In the **Result** field add the FirstName variable. This indicates that this variable is going to be updated with the value added by the user at this point.
7. Repeat steps 6 - 7 for the second and third **Input Dialog** activities to ask the user for his last name and hair color and store them in the LastName and HairColor variables.
8. Add a **Message Box** activity under the third **Input Dialog**.
9. Select the **Message Box** and, in the **Properties** panel, in the **Text** field, add the variables and a string to enable you to display all information gathered from the user, such as:

FirstName + " " + LastName + " has " + HairColor + " hair."

Name	Variable type	Scope	Default
FirstName	String	Main	...
LastName	String	Main	...
HairColor	String	Main	...

The final project should look as in below:

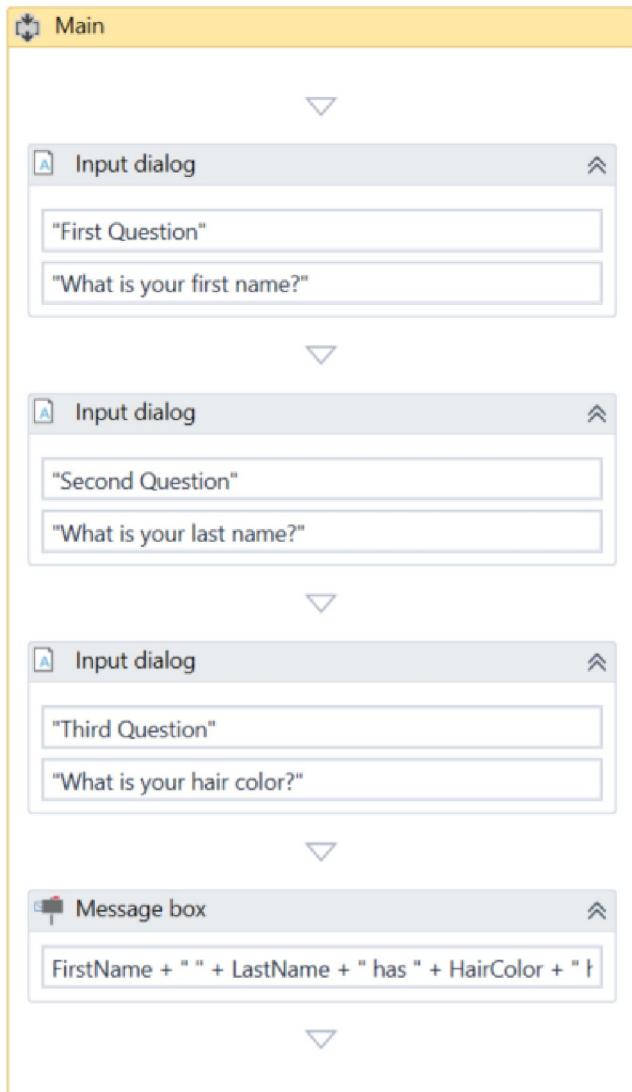
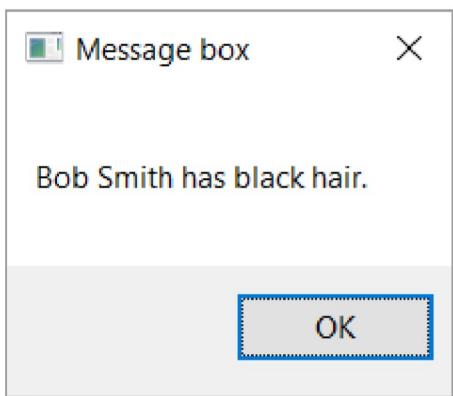


Figure 13 : Sequence Activity

On the **Design** tab, in the **File** group, click **Run**. The automation is executed. The final output message should look as in the following screenshot.



MULTIPLE ASSIGN

SOURCE FOR THE ACTIVITY: UiPath.Core.Activities.MultipleAssign

Multiple Assign Performs multiple assign actions, enabling you to assign values to multiple variables without the need to use multiple **Assign** activities. A common use case for this activity is initialization before large processes, sparing the user of the need to configure multiple **Assign** activities.

Properties

Common

- **DisplayName** - The display name of the activity.

Misc

- **Private** - If selected, the values of variables and arguments are no longer logged at Verbose level.

Using the Multiple Assign Activity

The Multiple Assign activity cannot be configured from the properties panel. Instead, you can directly assign values to variables by using the text fields in the body of the activity. The **To** field must contain the variable you want to assign a value to, and the **Value** field must contain the value itself.



Figure 14 : Mutliple Assign Activity

Using the **Add** button generates new pairs of fields that enable you to assign values to multiple variables simultaneously.

The **X** button on each row deletes the current pair of **To** and **Value** text fields.

The pairs of **To** and **Value** text fields added can be easily reordered. Place the cursor over the **Move** button, click and hold the left mouse button, then drag and drop the pair in its new position.

ADD DATAROW ACTIVITY

SOURCE OF THE ACTIVITY: UiPath.Core.Activities.AddDataRow

Add DataRow Adds a DataRow to a specified DataTable.

Properties

Input

- **ArrayRow** - An array of objects to be added to the DataTable. The type of each object should map to the type of its corresponding column in the DataTable.
- **DataRow** - The DataRow object to be added to the DataTable. If this property is set, then the **ArrayRow** property is ignored.
- **DataTable** - The DataTable object to which the row is to be added.

Common

- **DisplayName** - The display name of the activity.

Misc

- **Private** - If selected, the values of variables and arguments are no longer logged at Verbose level.

The example below explains how to read a database, create a new database and filter it based on the results. It presents activities such as **Read Range**, **Create Table**, **Insert Column**, **Build Data Table**, and **Add Data Row**. You can find these activities in the **UiPath.Excel.Activities** package.

This is how the automation process can be built:

1. Open Studio and create a new **Process** named by default **Main**.
2. Drag a **Sequence** container in the **Workflow Designer**.
 - Create the following variables:

Variable Name	Variable Type	Default Value
excelFile	String	"Exam results.xlsx"
resultsDt	System.Data.DataTable	-
studentGradesDt	System.Data.DataTable	-
passedStudents	Int32	0
failedStudents	Int32	0
statisticsDt	System.Data.DataTable	-

3. Drag an **Excel Application Scope** inside the sequence.

- In the **Properties** panel, add the value excelFile in the **WorkbookPath** field.
- Select the check boxes for the **AutoSave**, **CreateNewFile** and **Visible** options. The robot is now allowed to create a new Excel workbook, to automatically save all the changes made to it and to open the Excel file in the foreground while performing actions on it.

4. Place an **Excel Read Range** activity inside the **Do** sequence of the **Excel Application Scope** activity.

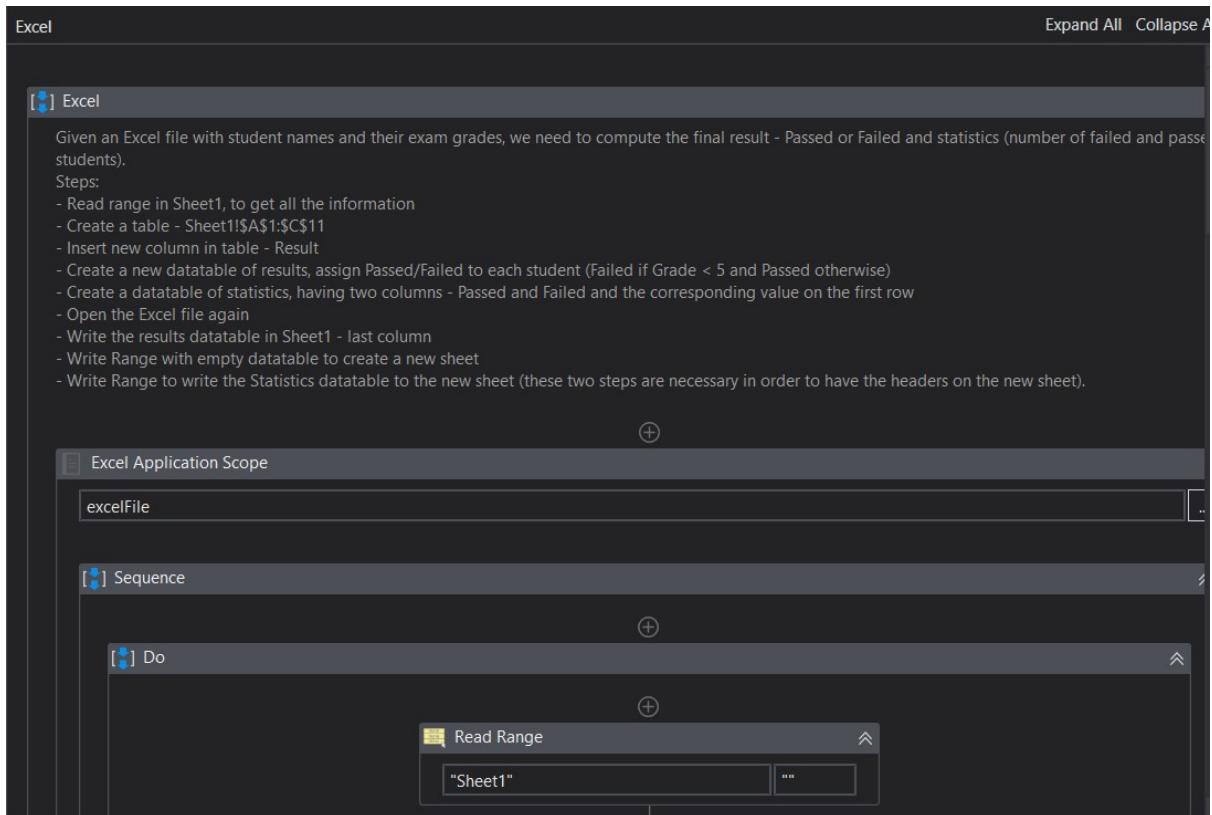
- In the **Properties** panel, add the value "Sheet1" in the **SheetName** field and the variable studentGradesDt in the **DataTable** output field.
- Select the check box for the **AddHeaders** options for considering the first row as header.

5. Drag a **Create Table** activity under the **Read Range** activity.

- In the **Properties** panel, add the value "Sheet1!\$A\$1:\$C\$11" in the **Range** field, the name "Grades" in the **TableName** field and the name "Sheet1" in the **SheetName** input field.

6. Add an **Insert Column** activity below the **Create Table** activity.

- Configure the following settings in the **Properties** panel: add the name "Result" in the **ColumnName** field, add the name "Sheet1" in the **SheetName** field and the name "Grades" in the **TableName** field.



7. Place a **Build Data Table activity under the **Insert Column** activity.**

- Add the variable resultsDt in the **DataTable** output field.
- Click on the **DataTable** button, inside the body of the **Build Data Table** activity.
- Click on the **Edit Column** button and add the name Result in the **ColumnName** field.
- Set the **Data Type as String**.
- Select the **Allow Null** check box to allow the robot to take into consideration the null values.
- Add the value 100 in the **Max Length** field.
- Select the **OK** option for closing the window.
- Select the **OK** button again to close the window.

8. Drag a **For Each Row activity below the **Build Data Table** activity.**

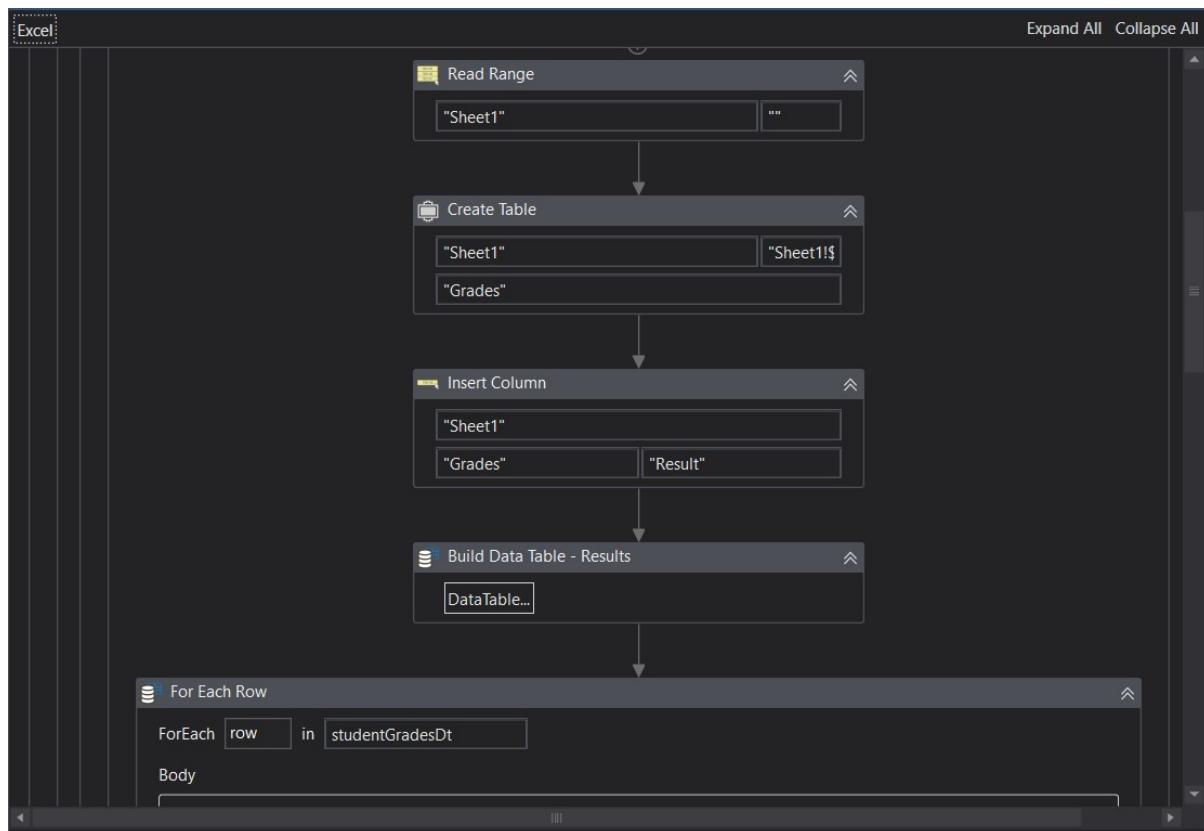
- In the **Properties** panel, add the variable studentGradesDt in the **DataTable** field.

9. Add an **If condition inside the body of the **For Each Row** activity.**

- Insert the value `cint(row("Grade")) < 5` in the **Condition** field. This formula analyses the data available in the row Grade from the .xlsx file and decides if the value is smaller or bigger than 5.

10. Drag two new **Sequences**, one in the **Then** and one in the **Else** fields.

- Name the sequence from the **Then** area Failed and the sequence from the **Else** area, Passed.



11. Place an **Add Data Row** activity inside the **Failed** sequence.

- In the **Properties** panel, add the condition `{ "Failed" }` in the **ArrayRow** field and the variable `resultsDt` in the **DataTable** field.

12. Place an **Assign** activity below the **Add Data Row** activity.

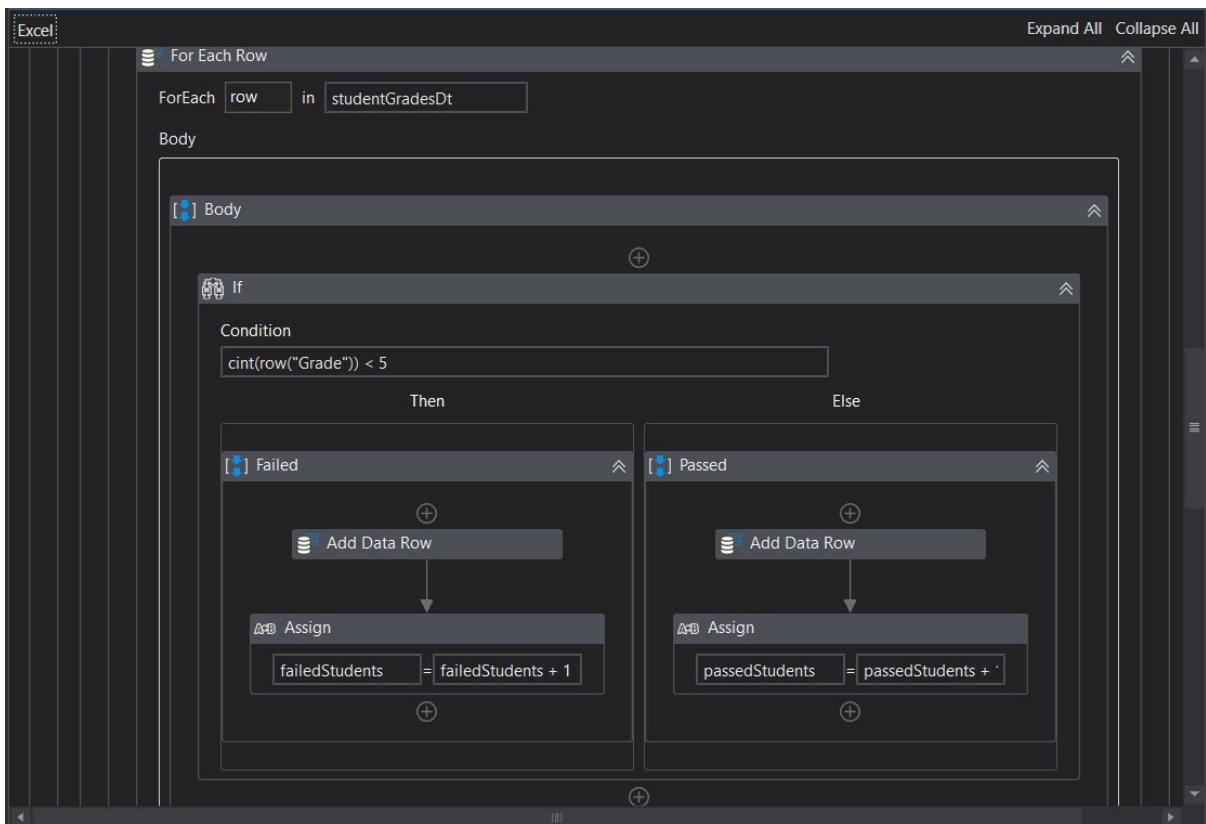
- Add the variable `failedStudents` in the **To** field and the condition `failedStudents + 1` in the **Value** field.

13. Place an **Add Data Row** activity inside the **Passed** sequence.

- In the **Properties** panel, add the condition `{ "Passed" }` in the **ArrayRow** field and the variable `resultsDt` in the **DataTable** field.

14. Place an **Assign** activity below the **Add Data Row** activity.

- Add the variable passedStudents in the **To** field and the condition passedStudents + 1 in the **Value** field.



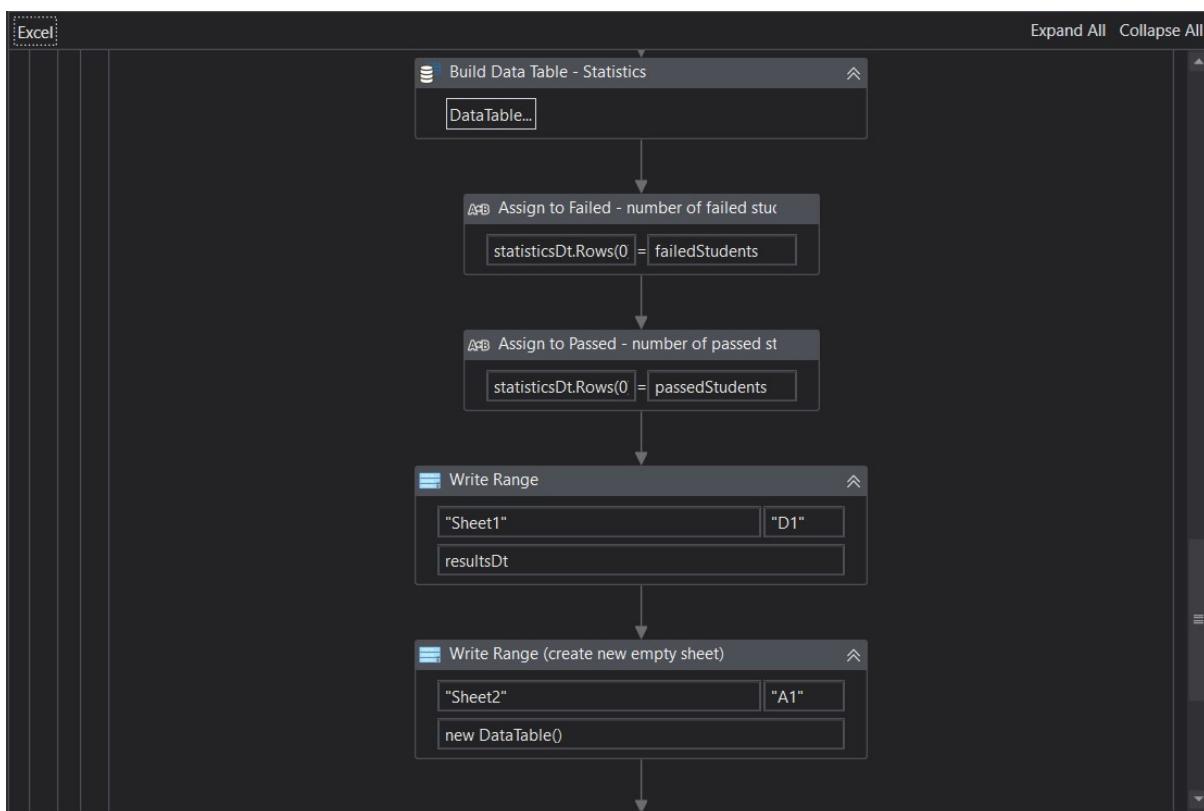
15. Place a **Build Data Table** activity under the **For Each Row** activity.

- In the **Properties** panel, add the variable statisticsDt in the **DataTable** output field.
- Click on the **DataTable** button, inside the body of the **Build Data Table** activity.
- Click on the **Edit Column** button from the left side and add the name Failed in the **ColumnName** field.
- Set the **Data Type** as **Int32**.
- Select the check box for the **Allow Null** option for allowing the robot to take into consideration the null values.
- Select the **OK** option for closing the window.
- Select again the **OK** button to close the window.
- Click on the **Edit Column** button from the right side and add the name Passed in the **ColumnName** field.

- Set the **Data Type** as **Int32**.
- Select the check box for the **Allow Null** option for allowing the robot to take into consideration the null values.
- Select the **OK** option for closing the window.
- Select again the **OK** button to close the window.

16. Add an **Assign** activity below the **Build Data Table** activity.

- Insert the condition `statisticsDt.Rows(0)("Failed")` in the **To** field and the variable `failedStudents` in the **Value** field.



17. Add another **Assign** activity below the previous one.

- Insert the condition `statisticsDt.Rows(0)("Passed")` in the **To** field and the variable `passedStudents` in the **Value** field.

18. Place an Excel **Write Range** activity underneath the **Assign** activity.

- In the **Properties** panel, add the name "Sheet1" in the **SheetName** field, the value "D1" in the **StartingCell** field and the variable `resultsDt` in the **DataTable** field.

19. Add a new Excel **Write Range** activity and place in below the first one.

- In the **Properties** panel, add the name "Sheet2" in the **SheetName** field, the value "A1" in the **StartingCell** field and the value new DataTable() in the **DataTable** field.

20. Drag another Excel **Write Range** activity below the previous one.

- In the **Properties** panel, add the name "Sheet2" in the **SheetName** field, the value "A1" in the **StartingCell** field and the variable statisticsDt in the **DataTable** field.
- Select the **AddHeaders** check box for the robot to consider the first row as header.

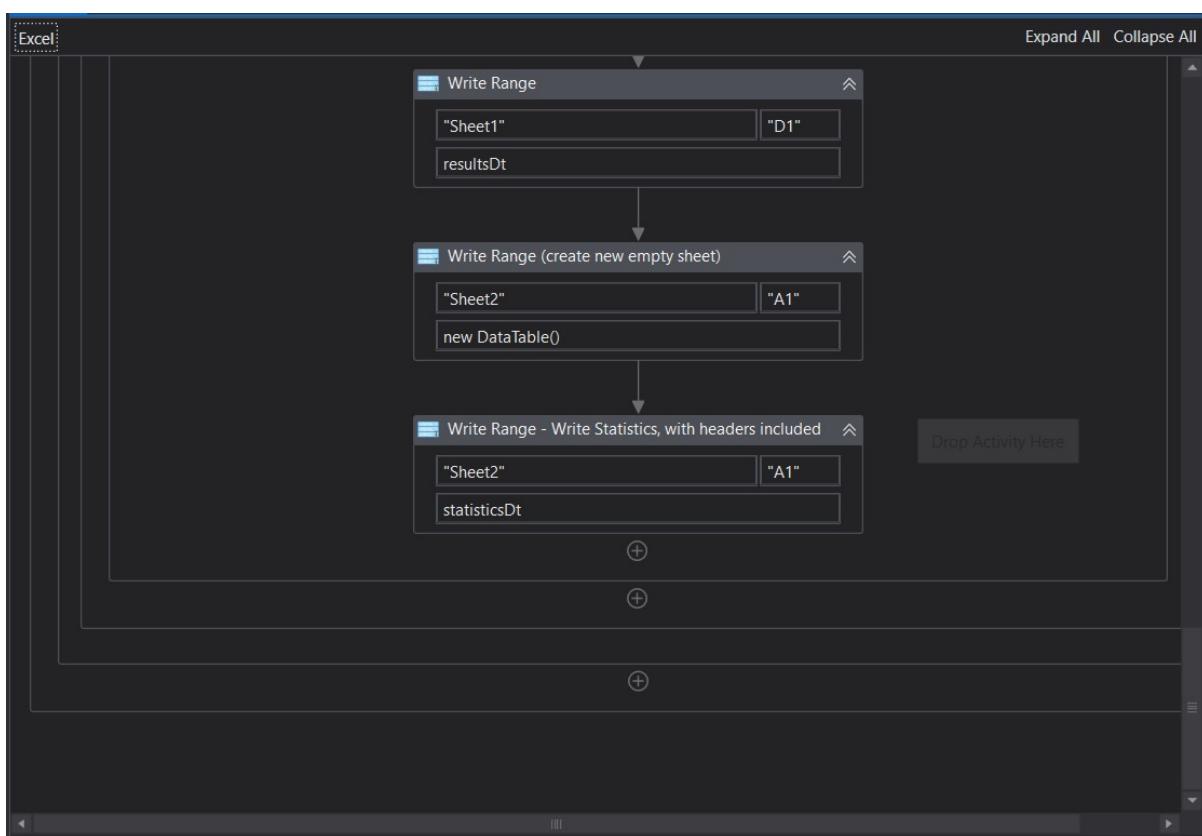


Figure 15 : Add DataRow Activity Example

21. Run the process. The robot reads the .xlsx file, analyzes the data, creates a new database and reorders the results as specified.

THE ASSIGN ACTIVITY

The **Assign** activity is an important activity that is going to be used quite often, as it enables you to assign a value to a variable.

You can use an **Assign** activity to increment the value of a variable in a loop, sum up the value of two or more variables and assign the result to another variable, assign values to an array and so on.

By default, this activity is also included in the **Favourites** group. To remove it, right-click it and select **Remove**.

READ RANGE ACTIVITY

SOURCE OF THE ACTIVITY: UiPath.Excel.Activities.ReadRange

ReadRange Reads the value of an Excel range and stores it in a **DataTable** variable. If the range isn't specified, the whole spreadsheet is read. If the range is specified as a cell, the whole spreadsheet starting from that cell is read.

Properties

Input

- **Range** - Specifies the range of cells to be read. If this value is not specified, the whole spreadsheet is read. If the value consists of only one cell, the whole spreadsheet is read starting from that cell. Only String variables and strings are supported.
- **WorkbookPath** - The full path of the Excel spreadsheet that you want to use. If the Excel file to be used is located in the project folder, its relative path can be used. Only String variables and strings are supported.
- **SheetName** - The name of the sheet in which the range that you want to read is. By default, this is filled in with "Sheet1." Only String variables and strings are supported.

Output

- **DataTable** - Stores the data extracted from the specified Excel range in a data table variable. Only data table variables are supported.

Options

- **AddHeaders** - When selected, the column headers from the specified spreadsheet range are also extracted. By default, this check box is not selected.

Automating Customer Support Tickets With RPA

- **Password** - The password of the Excel workbook, if necessary. Only String variables and strings are supported.
- **PreserveFormat** - Selecting this check box keeps the formatting of the cell that you want to read. By default, the check box is cleared.

Common

- **DisplayName** - The display name of the activity.

Misc

- **Private** - If selected, the values of variables and arguments are no longer logged at Verbose level.

WRITE RANGE

SOURCE FOR THE ACTIVITY: UiPath.Excel.Activities.ExcelWriteRange

WriteRange writes the data from a DataTable variable in a spreadsheet starting with the cell indicated in the **StartingCell** field. If the starting cell isn't specified, the data is written starting from the A1 cell. If the sheet does not exist, a new one is created with the value specified in the **SheetName** property. All cells within the specified range are overwritten. Changes are immediately saved. Can only be used in the **Excel Application Scope** or **Use Excel File** activities.

Properties

Common

- **DisplayName** - The display name of the activity.

Destination

- **SheetName** - The name of the sheet in which the range that you want to write to is. By default, this is filled in with "Sheet1". Only String variables and strings are supported.
- **StartingCell** - The cell from which to start writing the data. Only string variables and strings are supported.

Input

- **DataTable** - The data that you want to write to the specified range, as a DataTable variable. Only DataTable variables are supported.

Misc

- **Private** - If selected, the values of variables and arguments are no longer logged at Verbose level.

Options

- **AddHeaders** - When selected, column headers are also written to the specified range. By default, this check box is not selected.

9.CONCLUSION

Our objectives for the project are:

- Learn what is Robotic Process Automation(RPA)
- Learn Automation Anywhere RPA Tool
- Learn about Reusable Metabots
- Learn using UiPath Studio
- Learn about excel and email interfaces

Ultimately,

Develop a complete automation where no human intervention is required.

We have successfully developed a simple automation that does not require any human intervention.

The automation that we developed is :

Automating Customer Support Tickets Using RPA:

Given the email sent for customer tickets

- 1.Store the email data
- 2.Grab the data and store in the excel sheet
- 3.If there is a preloaded reply then it must be sent
- 4.The customer receives the email with the solution.

This saves the effective time of the user. Allows the user to spend this time on some creative and effective tasks.

Organizing is easier because the user can get the files from email and also from the drive. There is no need for the user to go into a particular folder in the system and check for the results.

Users need not to wait for the inputs to be processed as an email notification will be sent to the user once the job is done.

Users need not to worry about unexpected errors as in case of any error the bot can capture the error and send an email notification which the user can check and act accordingly.

10. FUTURE ENHANCEMENTS

The processes involved in this project are very simple ones. We want to apply the knowledge we gathered during this process to more complex processes like Student marks Analysis etc. As advancements to this particular project we can automate the way by which the user is gathering the input information.

The cases that comes in play are:

1. getting the data from a SQL database
2. Getting the data from a website
3. Getting the data from cloud
4. The data is in a PDF file, extract and manipulate the data to desired input formats
5. If the inputs are sent through email, then download attachments from email and use the inputs and many other data gathering ways.

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