Contents

1 Overview of current data storage

Two variants of the RUBY IoT system are provided, which the customer can choose between depending on the specific requirements and IT infrastructures:
Either as a physical device, i.e. as a hardware server with pre-installed software, or as an image that the customer hosts himself as a virtual machine in his data center. In both cases, RUBY provides an integrated solution with a server, on which a database and systems for processing and visualizing the data are provided. These systems are already pre-installed in the hardware server version, and are easy to install in an image format.

1.1 Physical device

The physical device of RUBY is supplied as a hardware server with pre-installed software. The customer can choose from different server versions, which differ in terms of the usable hard disk size, the CPU speed and the amount of RAM: The usable hard disk size varies between 2.4 TB and 11.7 TB, CPU speed of between 4x3.2 Ghz, 4x3.7Ghz and 8x3.2 Ghz, and the amount of RAM is between 32 GB and 384 GB. All servers are equipped with a XEON processor and are supplied as a rack with a height unit.

1.2 Virtual device

If RUBY is supplied as a virtual device, the system runs on a customer-provided virtualization platform. In this case, the customer ensures that his hardware is protected against failures. The customer is also responsible for providing sufficient power and storage capacity to fulfill the requirements of RUBY. The current requirements are contained in the document entitled "RUBY Connection Requirements", which is handed over during the sales consultation and jointly discussed with the customer.

1.3 Machines

As a supplier of state-of-the-art machines, our system consists of a combination of advanced hardware and powerful software. The software not only takes over the control of the machine, but it also visualizes all operation-related data. This helps to increase the degree of automation, and ensures that our machines are easy to operate.

The data that is generated during production is processed in software modules on the machine and then sent to RUBY via the network, where the data is received, stored and processed.

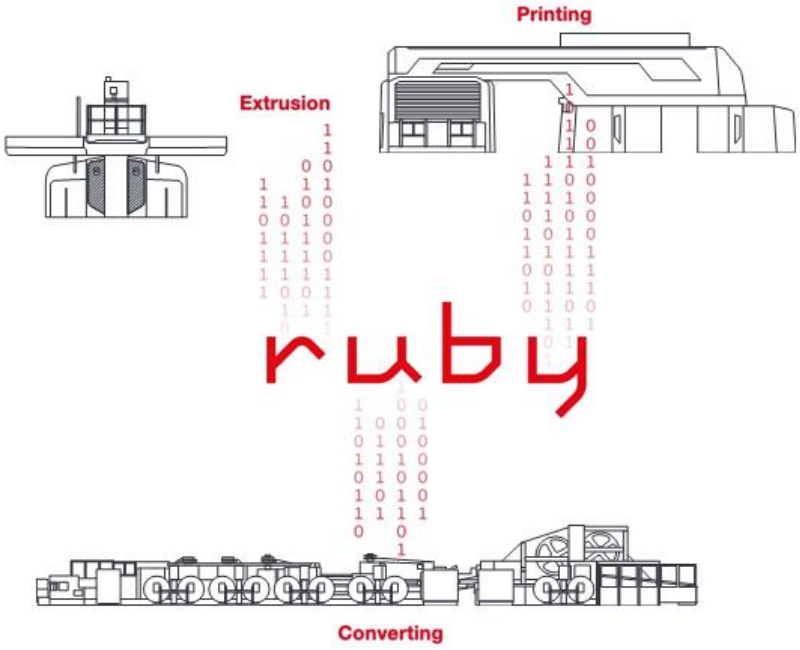

Figure 1 System architecture diagram

1.4 System architecture

RUBY is designed to allow data to be stored and analyzed centrally. For that purpose, a central server is used, which is connected to several machines via the customer network. The server's job is to collect the generated data from the machines, save it and make it accessible via a user-friendly user interface. The system architecture is designed in such a way that data can be efficiently acquired, managed and provided.

The operating system that is used is Ubuntu. The applications run in Docker containers. The relevant production data is stored in two databases, TimescaleDB and MongoDB. The combination of a central server and networked machines forms the basis for effective and professional data acquisition and analysis in the IoT area.

1.5 RUBY Cloud

RUBY can also be connected to a cloud to allow data to be used in a flexible and scalable way. The settings can be found in the administration area in the "RUBY Cloud" section.

Among other things, the cloud connection allows data to be retrieved at any time and from anywhere via the RUBY app, even outside the company network.

Figure 2 RUBY App

The use of the cloud also means that you also have the option of permanently archiving data. The cloud integration extends the functionality and makes it easy to handle and monitor the data. This makes it possible for customers to access historical production data for an unlimited period of time, for continuous optimization of production performance.

1.6 Data availability

The amount of data that is generated on a daily basis with normal use of the machines and connected systems is up to approximately 2.5 GB per machine. This value is a rough guideline and may vary depending on the type of machine operation.

It makes sense to continuously monitor the system so that appropriate measures can be taken in good time if required in order to ensure that RUBY operates smoothly.

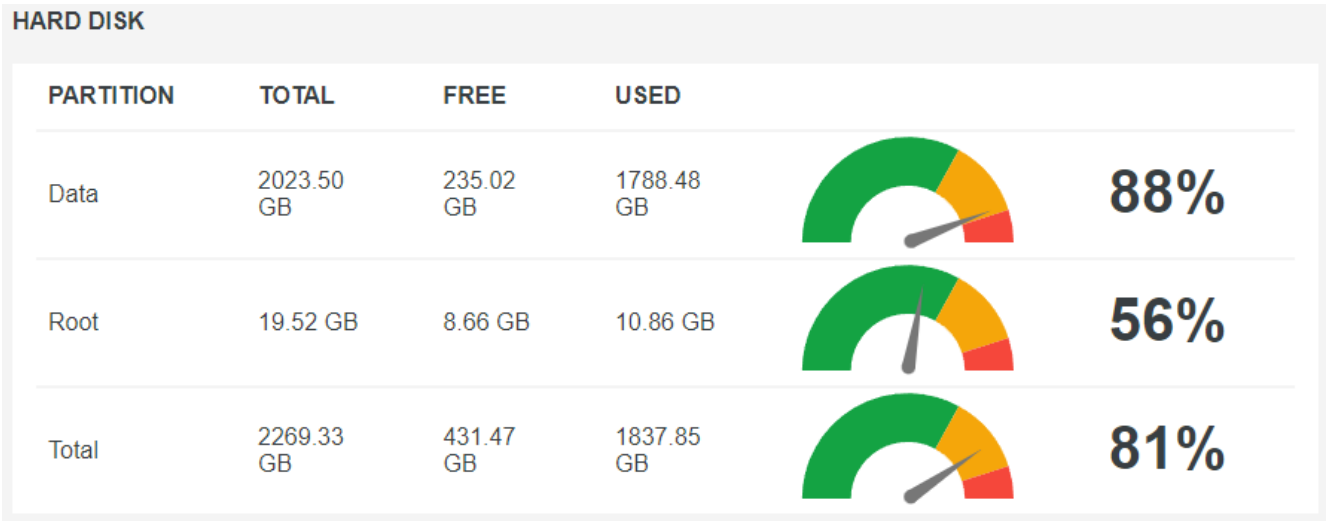

Figure 3 Administration area: Overview of the hard disk utilization for the RUBY system.

Automatic hard disk drive capacity protection is integrated at the system side. A TimeToLive (TTL) parameter is calculated in RUBY for this purpose. This parameter specifies the number of weeks the data is stored before it is automatically deleted from the system. When the TTL is calculated automatically, the average amount of data that has been accumulated in the past is used as a reference value. Major fluctuation in the quantity of data may lead to undesirable loss of data. The current TTL value can be viewed at any time on the ADMIN page of RUBY and adjusted manually by the customer.

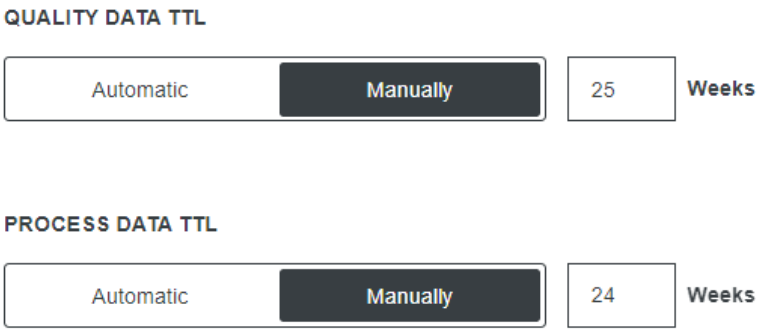

Figure 4 ADMIN area: Setting options for the TTL parameter in the store management system.

2 Risk of data loss

As the provider of RUBY, we aim to ensure that the system availability is good. To do this, we monitor the hard disk utilization using a monitoring system via VPN, among other things.

2.1 Hardware failures

2.1.1 Hardware

Regular monitoring and maintenance of the devices, appropriate air conditioning and protection against overvoltage, vibrations and impacts help to keep hardware damage to a minimum. Appropriate monitoring of the hardware and the network by the customer helps to prevent any hardware issues.

2.1.2 Faulty hard disks

Faulty hard disks are one of the most common causes of data loss due to hardware defects. The use of a RAID system provides greater fail-safety.

2.1.3 Power failures

A power failure can lead to unforeseen system crashes and potential loss of data. To prevent incidents such as these, we recommend using an emergency power supply (UPS). A UPS ensures that the system can continue to be operated or shut down properly in the event of a power failure. This prevents permanent damage to system data, without which the entire system would no longer function.

2.1.4 Network issues

A data transfer error may lead to loss of data on the server. This may occur due to technical issues or malfunctions in the network. Changes to the network infrastructure, e.g. firewall settings, are also a frequent cause of communication problems in the network. Regular monitoring and maintenance of the network should prevent issues such as these, and ensure the data is transferred in a reliable way.

Large quantities of data can lead to bottlenecks in the network bandwidth and therefore cause network issues. It is important for the required bandwidth to be calculated in advance and an adequate network infrastructure to be provided.

2.2 Software errors

2.2.1 Software

Programming errors or conflicts with other software may result in software errors. A software error may make the system crash or result in data being erroneously saved or deleted. It is important for the software to be updated on a regular basis. This helps to keep software errors to a minimum.

2.2.2 Software updates

As soon as a new software version is available, the customer will be informed by email about the pending update. Provided that the data connection to the W&H servers has been enabled by the customer, the update is installed automatically overnight from Sunday to Monday as standard. The point in time can be adjusted in the ADMIN pages of the RUBY system in the "Update" section. The system cannot receive any data during installation. We recommend carrying out a backup of the RUBY system prior to each update.

2.2.3 Database errors

Databases are an important part of many IT systems, and are crucial for storing and managing data. However, errors in databases may lead to loss of data and system failures.

2.3 Human error

2.3.1 Accidental data deletion

Accidental data deletion may lead to loss of data. RUBY has a user and rights management system, which makes it possible for targeted access rights to be granted. It is the customer's responsibility to assign roles accordingly.

2.3.2 Incorrect configurations

The system configuration can be adjusted in the ADMIN view of RUBY. It is important for the customer to check the configurations carefully and at regular intervals in order to ensure that the system is working properly, and that data is being stored in a safe way. To prevent mistakes during configuration, support is available from our RUBY support team, and we can also provide training courses. It is useful if the customer has documentation at the ready, in order to ensure that the system is recovered quickly in the event of a problem.

3 Measures for preventing data loss

3.1 Regular data backups

Lost data can be restored by taking backups on a regular basis. It is the customer's responsibility to back up his data at regular intervals, e.g. by means of incorporation into a backup system. We would be pleased to assist our customers with this process.
For the purpose of restoring the data (recovery), we recommend to our customers that they should prepare an emergency plan and test the data backup and recovery process at regular intervals.

3.1.1 Use of RAID systems for data mirroring

The physical device for RUBY is fitted with a RAID system (Redundant Array of Independent Disks). RAID provides improved failure safety by using multiple hard disks which store data redundantly. In the event of a hard disk failure, the system can restore the data from the remaining hard disks. However, it is important to note that RAID does not provide complete protection against data loss – for example, several hard disks could fail at the same time or the entire system could become damaged. This is why we still recommend that our customers back up their data at regular intervals.

3.1.2 Using the RUBY cloud for data archiving

The RUBY cloud provides a reliable facility for archiving production data from the RUBY system. Using a cloud-based data archiving system saves data permanently and independently of the storage capacity of the local RUBY systems. The archived production data can be loaded back into the local RUBY system at any time for further analysis and to improve future production performance. This means that RUBY platform customers have access to their important production data at all times. However, the data archiving system in the RUBY cloud is not a backup system, so it cannot be a substitute for regular data backups.

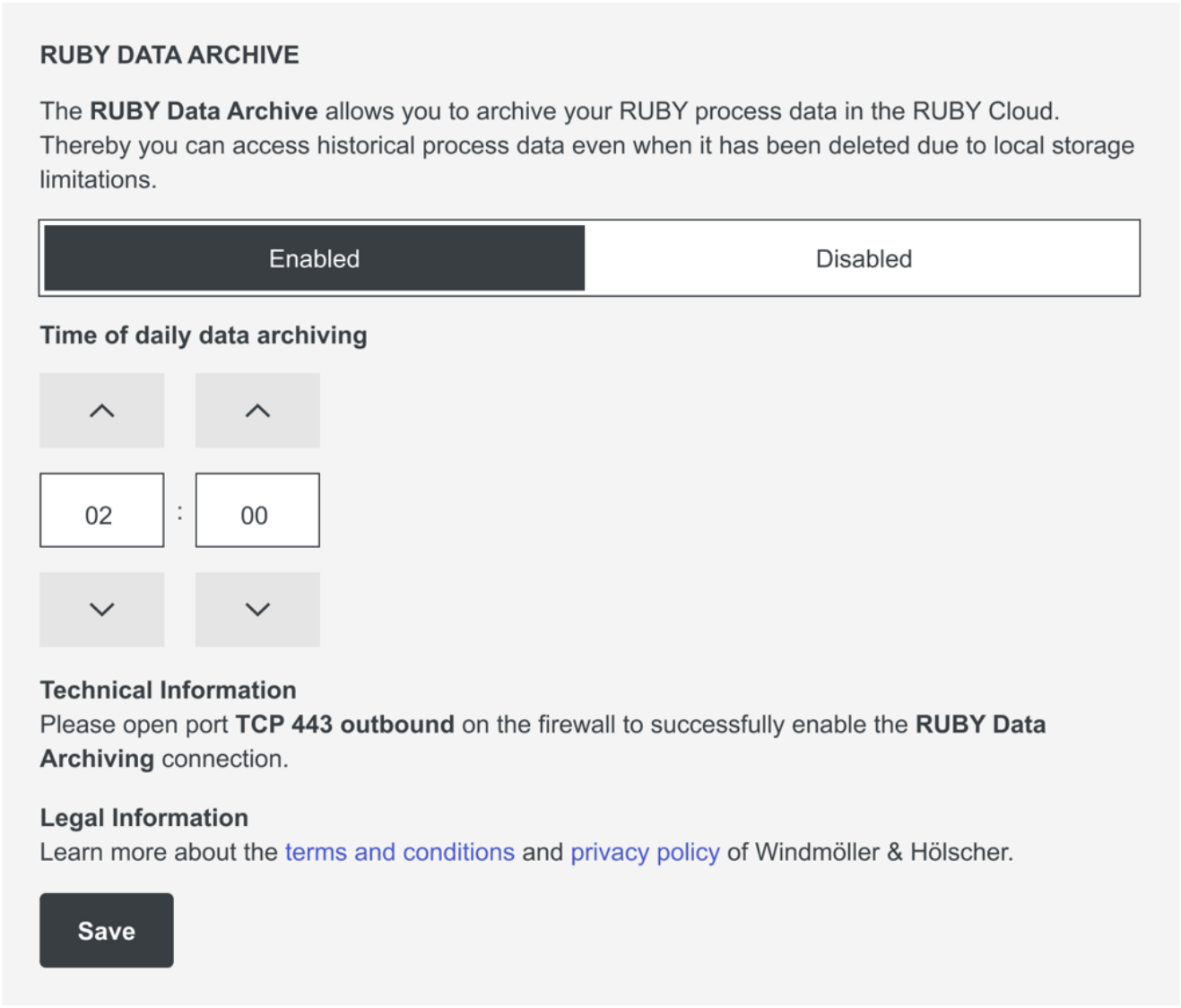

Figure 5 ADMIN area: Data archiving in the RUBY cloud

3.2 Employee training

We recommend that our customers give their RUBY administrators training at regular intervals in order to prevent any operating and configuration errors. Participation in this training teaches them how to effectively back up data, and which measures to take in the event of a failure. Regularly training administrators is an important constituent of a successful data security strategy.

4 What to do in the event of data loss

4.1 Being prepared for an emergency

We recommend that the customer prepares an emergency preparedness plan in order to be able to act quickly and effectively in the event of data loss. This should include the steps for restoring the data as well as the responsibilities of the parties involved. It is also advisable to carry out data backups on a regular basis, and to keep at least one additional copy of important data in a safe location. In severe cases, an external expert should be commissioned to restore the data.

4.2 Recovery plan

A recovery plan is an important part of every data security strategy, and includes the steps to be taken in the event of data loss. A recovery plan includes:

1. Risk analysis: Checking the type and extent of the data loss.
2. Identifying the affected data: Determining the data that needs to be restored.
3. Choosing the recovery method: Making a decision as to which technology or method is the most suitable for restoring the data.
4. Implementing the recovery plan: Using the selected technology or the procedure for recovering the data.
5. Checking the restore: Checking whether the data has been restored fully and correctly.

The customer is responsible for backing up the data at regular intervals and the recovery plan. We would be pleased to assist you.

5 Conclusion and recommendations

Despite careful checking of the hardware and software, failures and data losses may still occur. We therefore strongly recommend that the customer takes appropriate measures such as regular backups, monitoring and maintenance, and also training on how to use the system. In the event of data loss, it is important to have a recovery plan in place and check it at regular intervals. The RUBY Support team would be pleased to lend a hand with the measures mentioned here.
When it comes to continuous use of the production data in RUBY, we also recommend using the data archiving system in the RUBY cloud.

6 Contact information for the RUBY support team

Email: ruby-support@wuh-group.com

Hotline: +49 5481 14 3333