

RFID SYSTEMS

Mobile Readers

Function Manual · 12/2010

Valid for the following products:

SIMATIC RF310M

SIMATIC RF610M

SIMATIC RF680M

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RFID Systems Mobile Readers

Function Manual

Introduction

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RFID Reader Interface
User's Guide

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RFID Reader Interface
Reference

3

Valid for the following products:

SIMATIC RF310M
SIMATIC RF610M
SIMATIC RF680M

12/2010

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CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

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Introduction

This document describes the RFID Reader Interface for the SIMATIC handheld systems RF680M, RF610M and RF310M and how this interface can be utilized.

The document consists of two parts. The first part gives you an overview of how the RFID Reader Interface can be used and the second part contains a detailed reference description of the RFID Reader Interface.

While this document describes the usage of the RFID module within the handheld device it neither includes nor describes how other features of the device such as barcode detection, WLAN or updates of the operating system itself are used. You have to directly contact the device vendor PSION in order to get software and support for these features.

You get an overview regarding topics such as WLAN and barcode by consulting the handheld device manual. Detailed developer information, however, is still to be retrieved from the device vendor PSION directly.

This version of the RFID Reader Interface will also be integrated in the SIMATIC RF-MANAGER 2008 product which allows you to configure handheld devices to work in integrated scenarios. As far as these scenarios deal with issues such as barcode handling, these issues will be covered in this document either at least from a functional perspective.

This document will use the short form RF-MANAGER as an abbreviation for convenience when speaking of SIMATIC RF-MANAGER 2008 and RFxxxM as one of the handhelds RF680M, RF610M or RF310M..

RFID Reader Interface User's Guide

2.1 RFID Reader Interface

Simatic Handheld devices enable end users to acquire tag data from any place without the limitations of a cable-bound system. It provides the hardware as well as a software application to use the features of the mobile reader.

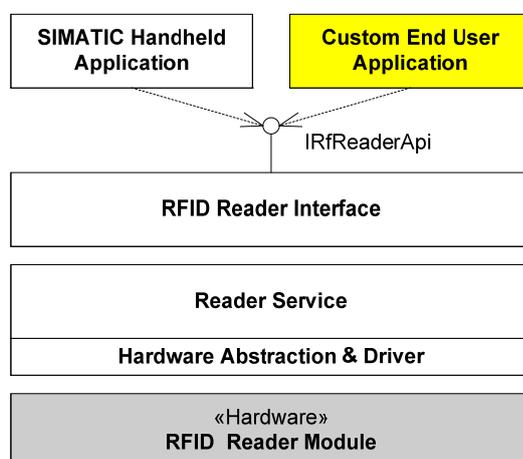


Figure 2-1 Software system structure on a SIMATIC Handheld device.

The Figure above shows the main components of a SIMATIC Handheld device. Obviously, a piece of hardware is necessary – the RFID Reader Module – to acquire RFID information. The capabilities of this hardware are accessed by a driver that is also used by the reader service which is the software component that controls all RFID features.

The Simatic Handheld application utilizes the reader service's features and provides customers with a user interface that can trigger all RFID features made available by the reader service (IRfReaderApi). However, the application has no information on the special requirements or the business processes of end customers.

Since a single application can almost never meet every need of every customer, another approach is used. Instead of inflating the application with a large number of possible options while still missing others, only the basic features are supported.

To facilitate the end user's needs, these basic functions are provided by an interface that allows custom applications to fully exploit all RFID features with programming and to add the customer's own workflows and relationships to suit his needs.

It would have been possible to directly access the reader service component via an interface that extends the EPC standards. However, these standards are complicated and use many internal concepts and entities. You do neither need nor probably want to know these details if your only objective is to simply access and write data to RFID tags. That is why all this complexity is hidden behind a simple interface - the RFID Reader Interface.

The following sections will explain how to use this interface in your work. Detailed information about all the functions provided by this interface is given in the next chapter.

2.2 How Do I Use the Reader Interface?

So far, so good. We have learned that there is an easy way to access the RFID features of a handheld device. But how do we do this?

2.2.1 Tools Needed

First, we will create a small sample application that only reads tags.

What tools will you need?

The interface is a .Net CompactFramework 2.0 SP2 assembly. Logically this requires a derivate of the Microsoft Visual Studio 2005 as its starting point. Remember that the Express versions will not be sufficient because they do not allow the installation of additional device packages. You will need at least the Standard or Professional version of Visual Studio 2005.

Next comes the installation of the software development kit (SDK) from PSION Teklogix. This software kit is available from developer resources on the PSION TEKLOGIX website (www.pSIONteklogix.com) after registration.

These are all the development tools you need to get started. Although you can now create applications targeting a handheld device such as the RF610M, you will also need to transfer the developed software to the handheld device. This means that Microsoft ActiveSync must also be installed.

Moreover, in order to utilize the RFID features you will also need to reference the RFID Reader Interface assembly within your applications. This assembly is available on your handheld device. You can retrieve the file `Siemens.Simatic.RfReaderApi.dll` via ActiveSync from the handheld device (`\Flash Disk\SIMATIC xxx\Support\RFID_API\RFID_API.ZIP`) and store it to reference the assembly.

You should now be able to create, deploy and run your custom applications.

The table below summarizes the required components for the Reader Interface Version V1.3 and higher.

Be aware that the handheld device must also support at least Reader Interface Version V1.3. The Reader Interface Version will be displayed as "API Version" with the handheld device application via the menu "Tools -> Reader Status".

Tool / Component	Description	Vendor
Microsoft Visual Studio 2005 (at least Standard edition) (at least CompactFramework 2.0 SP2)	The basic development environment	Microsoft
PSION TEKLOGIX Mobile Devices Software Development Kit (SDK)	Enables creation of applications for Windows CE devices	PSION
Microsoft ActiveSync	Enables communication between your development PC and a handheld device	Microsoft
Siemens.Simatic.RfReaderApi.dll RFIDDriver.dll PsionTeklogicNet.dll Siemens.Simatic.RfReaderApi.dll.config	The RFID Reader Interface assembly Even if this assembly is enough to compile, don't forget to provide RFIDDriver.dll, PsionTeklogicNet.dll and Siemens.Simatic.RfReaderApi.dll.config for executing your own application.	All of these components are provided on the device's flash memory within a compressed archive.

Moreover, the sample code of the small demo application developed within the following chapters is also available on the device's flash disk.

2.2.2 Creating the Application

To start a new application for a handheld device, create a new project of type 'Visual C#\Smart Device\Windows CE 5.0\DeviceApplication' since handheld devices currently run under Windows CE 5.0.

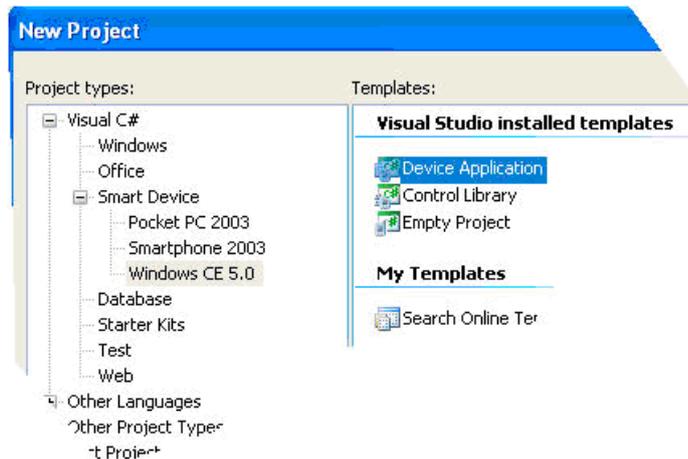


Figure 2-2 Type of application to create for a handheld device

You will need menu items to start and stop the reader and to trigger a read command. Moreover, you will provide a textbox to display the results. This gives you a simple GUI as shown in the following figure.

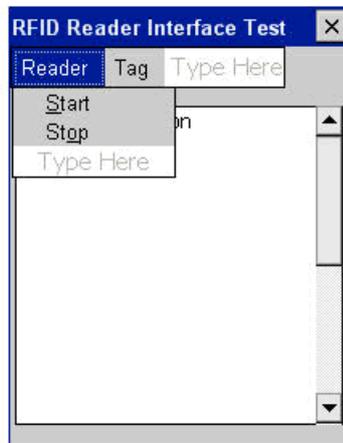


Figure 2-3 Our simple test application

2.2.3 Starting the RFID reader

So far this application has nothing unusual about it. It is not yet connected to RFID. This is done by coding the event handler for the menu items. The code is provided below. It will be discussed in detail.

To simplify development, first add a reference to the RFID Reader Interface assembly and a directive for the namespace `Siemens.Simatic.RfReader` which enables you to use 'intelli-sense' on the types provided by the RFID Reader Interface.

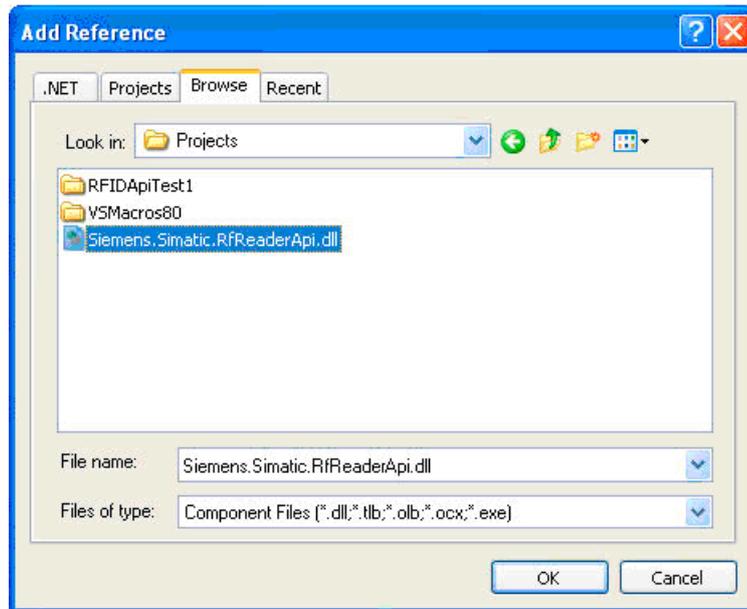


Figure 2-4 Adding a reference to the reader interface: Go to where you filed the interface assembly which you retrieved from the handheld device.

Your first job is to start the reader service (see the RFID management component reader service in RFID Reader Interface (Page 9))

The interface `IRfReaderApi` provides a method `StartReader` to accomplish that. Using the function, however, poses two new questions:

- First, you will need a parameter to provide initialization data. This is done by creating an object of type `RfReaderInitData`. The only parameters necessary is the reader type and the reader mode, which we set to standalone for now. For all other members of `RfReaderInitData` we accept the defaults.
- The `StartReader` function also offers other options that allow you to specify other instance names or IP Addresses, but, for the time being, you can use the defaults. Now that you know which function to call, the second task is – where do you obtain an object that implements the `IRfReaderApi` interface.
A public static property called `RfReaderApi.Current` exists that always returns the current instance of the object which implements the RFID Reader Interface.

What if you start again and no current instance is available? The `Current` property is designed to return the current instance of the RFID Reader Interface if one exists or to create a new one if none exists. If processing is correct, `RfReaderApi.Current` will always return a valid instance be it a new one or an existing one. Null is only returned when internal errors occur. Since this may cause exceptions, you must put a try catch frame around your calls.

Another look at our code shows that only four lines of code are needed to start up the reader service. The code for starting the RFID Reader Interface:

```
private void menuReaderStart_Click(object sender, EventArgs e)
{
    try
    {
        // We want to create and start an instance of the RFID
        // reader interface for a handheld device with a default name.
        RfReaderInitData initData = new RfReaderInitData();

        // Initialize the appropriate reader type (RF680M,RF610M,
        RF310M)
        // and reader mode
        initData.Type = „RF680M“;
        initData.Mode = RfReaderInitData.ReaderMode.Standalone;

        // With RfReaderApi.Current we address the current
        // RFID reader interface instance
        // or initiate the creation of a new instance.
        // StartReader connects to an existing reader service
        // or creates a new reader service.
        RfReaderApi.Current.StartReader(initData);
    }
    catch (RfReaderApiException rfidException)
    {
        // Something went wrong while starting the reader.
        // More information is available by inspecting the
        // RfReaderApiException's members ResultCode, Error,
        // Cause and Description.
        ...
    }
}
```

Stopping a running reader only requires a single call that terminates the connection to the underlying reader service and shuts it down; The code for stopping the RFID Reader Interface:

```
private void menuReaderStop_Click(object sender, EventArgs e)
{
    try
    {
        // Use the current reader interface instance and tell
        // it to shut down.
        RfReaderApi.Current.StopReader();
    }
    catch (RfReaderApiException rfidException)
    {
        // Something went wrong while stopping the reader.
        // More information is available by inspecting the
        // RfReaderApiException's members ResultCode, Error,
        // Cause and Description.
        ...
    }
}
```

A last issue we have to consider is that the RFID reader service needs time to initialize his internal states. The good news is that after initialization the reader service will use its Alarm event mechanism to notify clients when it is ready to start work. In order to catch this information, we have to implement an alarm handler.

The alarm handler function has to comply with the following prototype that defines the special RfAlarmArgs parameters.

```
public void AlarmHandler(object sender, RfAlarmArgs alarmArgs)
```

Before starting the reader we add the alarm handler:

```
RfReaderApi.Current.Alarms += new RfAlarmHandler(this.AlarmHandler);
```

Once installed, our AlarmHandler function gives us a chance to notice a successful startup or restart by catching the 'Reconfiguration' and 'Initial' alarms:

```
public void AlarmHandler(object sender, RfAlarmArgs alarmArgs)
{
    if (alarmArgs.InfoItems != null)
    {
        // Configuration has finished
        if (alarmArgs.InfoItems[0].Name == "Reconfiguration" &&
            alarmArgs.InfoItems[0].Value == "Initial")
        {
            // This is the very first startup of the application
            // Now we can access RFID reader
            ...
        }
    }
}
```

2.2.4 Compile and Run

Even if tags cannot be read yet, you can create an application to prove that it can at least start up and shut down. You can improve the visual appearance by indicating the status of the functions which you called in the results window of your application; The code for starting the RFID Reader Interface:

```
private void menuReaderStart_Click(object sender, EventArgs e)
{
    try
    {
        // First, we add an event handler to catch alarm notifications
        RfReaderApi.Current.Alarms +=
            new RfAlarmHandler(rfmIntegration.AlarmHandler);

        // We want to create and start an instance of the RFID
        // reader interface for a handheld device with a default name.
        RfReaderInitData initData = new RfReaderInitData();

        // Initialize the appropriate reader type (RF680M, RF610M,
        RF310M)
        // and reader mode
        initData.Type = „RF680M“;
        initData.Mode = RfReaderInitData.ReaderMode.Standalone;

        // With RfReaderApi.Current we address the current
        // RFID reader interface instance
        // or initiate the creation of a new instance.
        // StartReader connects to an existing reader service
        // or creates a new reader service.
        RfReaderApi.Current.StartReader(initData);
        WriteInformationLine("Reader started successfully");
    }
    catch (RfReaderApiException rfidException)
    {
        // Something went wrong while starting the reader.
        // More information is available by inspecting the
        // RfReaderApiException's members ResultCode, Error,
        // Cause and Description.
        WriteInformationLine(string.Format("ERROR: {0} - {1}, cause:
            {2}, desc: {3}\r\n",
            rfidException.ResultCode, rfidException.Error,
            rfidException.Cause, rfidException.Description));
    }
}
...
```

```
public void AlarmHandler(object sender, RfAlarmArgs alarmArgs)
{
    if (alarmArgs.InfoItems != null)
    {
        // Configuration has finished
        if (alarmArgs.InfoItems[0].Name == "Reconfiguration" &&
            alarmArgs.InfoItems[0].Value == "Initial")
        {
            // This is the very first startup of the application
            // Now we can access RFID reader
            WriteInformationLine("INFO: Initial
                                reconfiguration");
        }
    }
}

...
private void WriteInformationLine(string message)
{
    WriteInformation(message + "\r\n");
}

private void WriteInformation(string message)
{
    // Add the information to the existing text
    this.textBoxInfo.Text = this.textBoxInfo.Text + message;
    this.textBoxInfo.SelectionStart = this.textBoxInfo.Text.Length;
    this.textBoxInfo.ScrollToCaret();
}
```

Compilation should be successful unless you forgot to add the reference to the interface assembly and the corresponding directive using `Siemens.Simatic.RfReader`.

When you deploy your application, there are two things to consider.

- When using Visual Studio to deploy your application, make sure you selected "PtxPxa27x: ARMV4I_Release as a target device.
- Regardless of how you deploy your application, ensure that all needed system components are located beneath your application.
 - This means you must provide the RFID Reader Interface assembly Siemens.Simatic.RfReaderApi.dll and its configuration file Siemens.Simatic.RfReaderApi.dll.config.
 - You also must provide the following Psion-specific files
RFIDDriver.dll
PsionTeklogicNet.dl

All of these are provided on the device's flash memory within a compressed archive.

2.2.5 I Want To See Tags...

You are able to start and stop the RFID reader service and would now like to see tags. Another look at the RfReaderApi interface reveals a member called GetTagIDs. Checking the return value's type indicates that you will receive an array of strings containing the read tag IDs.

You already know how to obtain an instance of an object providing the IRfReaderApi interface. The code is shown below; The code for reading tag IDs:

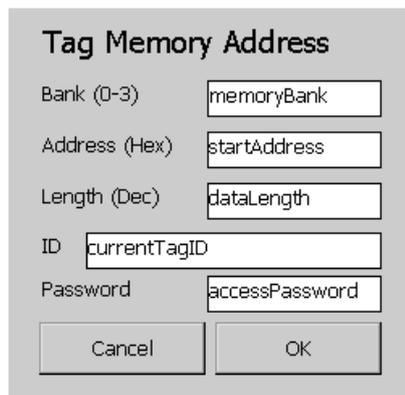
```
private void menuItemReadIDs_Click(object sender, EventArgs e)
{
    string[] tagIDs = null;
    try
    {
        // Request all tags that are currently within reach
        tagIDs = RfReaderApi.Current.GetTagIDs();
    }
    catch (RfReaderApiException rfidException)
    {
        // Something went wrong while reading tags.
        // More information is available by inspecting the
        // RfReaderApiException's members ResultCode, Error,
        // Cause and Description.
        WriteInformationLine(string.Format("ERROR: {0} - {1}, cause:
        {2}, desc: {3}\r\n",
        rfidException.ResultCode, rfidException.Error,
        rfidException.Cause, rfidException.Description));
    }
    // Display read tags ...
    if (null != tagIDs && tagIDs.Length > 0)
    {
        for (int index = 0; index < tagIDs.Length; index++)
        {
            WriteInformationLine(" > tagID " + index.ToString() + ": " +
            tagIDs[index]);
        }
    }
    else
    {
        // or a message telling us there were no tags
        WriteInformationLine(" > No tags in field");
    }
}
```

As you can see, it is easy to read tag IDs.

2.2.6 Know More about the Tags ...

You can learn more about tags in the same way that you can access additional data on tags or write data to tags.

Some additional data must be specified. For our test scenario the most flexible way to provide these data is to enter them with the user interface as shown below:



The image shows a dialog box titled "Tag Memory Address". It contains five input fields, each with a label and a value: "Bank (0-3)" with "memoryBank", "Address (Hex)" with "startAddress", "Length (Dec)" with "dataLength", "ID" with "currentTagID", and "Password" with "accessPassword". At the bottom of the dialog are two buttons: "Cancel" and "OK".

Figure 2-5 A dialog for entering the address of the additional tag data to be read

Once you have acquired the address of the data, accessing the data is easy. The code for acquiring data is given in the Figure below.

Note how the specified data is returned as an array of bytes with the requested length. Be sure to check for a null reference which is returned if no data could be read.

When you request additional data from EPC Gen2 tags, the tag to be addressed must always be specified by giving its tag ID. Only if a EPC Gen2 tag with a matching ID is detected will the operation succeed.

Reading additional tag data:

```
byte[] buffer = null;
try
{
    // Code for invoking a dialog and retrieving the data entered
    left out for brevity -> check sample code for details
    ...
    // Request all tags that are currently within reach
    buffer = RfReaderApi.Current.GetTagMemory(
        currentTagID, memoryBank,
        startAddress, dataLength,
        accessPassword);
    ...
    // Code to show the resulting buffer left out for brevity ->
    check sample code for details
}
catch (RfReaderApiException rfidException)
{
    // Something went wrong while reading additional data
    WriteInformationLine(string.Format("ERROR: {0} - {1}, cause:
    {2}, desc: {3}\r\n",
    rfidException.ResultCode, rfidException.Error,
    rfidException.Cause, rfidException.Description));
}
```

2.2.7 Change the Tags' Data

When the data on a tag must be changed, the same restriction applies on EPC Gen2 tags as with obtaining additional data. The EPC Gen2 tag that you want to change must be specified by supplying its ID. Only if a matching tag is detected will the operation succeed.

How to write a new ID to an existing tag for a data-change function (for EPC GEN2 only): The tag's current ID must be supplied together with the new ID and a password (if needed) and an instance of an object must be used that implements the IRfReaderApi which is always available via RfReaderApi.Current.

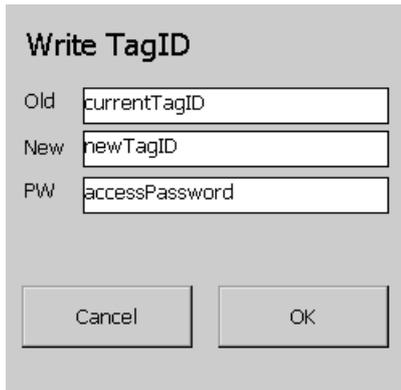


Figure 2-6 Write TagID

Below is the code for accomplishing this; writing a new tag ID to a tag:

```
try
{
    // Code for invoking a dialog and retrieving the data entered
    // left out for brevity -> check sample code for details
    ...
    // Request all tags that are currently within reach
    RfReaderApi.Current.SetTagID(
        currentTagID, newTagID,
        accessPassword);
}
catch (RfReaderApiException rfidException)
{
    // Something went wrong while writing data
    AddInformation(string.Format("ERROR: {0} - {1}, cause: {2},
        desc: {3}\r\n",
        rfidException.ResultCode, rfidException.Error,
        rfidException.Cause, rfidException.Description));
}
```

2.2.8 Summary

Using the RFID Reader Interface is easy if you keep the few important points below in mind.

- Be sure to reference the `Siemens.Simatic.RfReaderApi.dll` assembly, use its namespace and place the assembly beneath your application on the target device.
- Access the member `RfReaderApi.Current` whenever you want to use the RFID Reader Interface.
- Remember that member functions which return data may also return null if no data are found.
- Don't forget to check `RfReaderApiExceptions` that indicate malfunctions and errors.
- And please make sure you always place the following files beneath your application so that it is able to run.
`Siemens.Simatic.RfReaderApi.dll`
`Siemens.Simatic.RfReaderApi.dll.config`
`RFIDDriver.dll`
`PsionTeklogicNet.dll`

With these simple guidelines and the description of the RFID Reader Interface's member functions you should be able to implement your own business logic for a standalone RFID client application without having to bother too much with the details of RFID processing.

See the sample code provided that shows the RFID Reader Interface functions in use.

If you are intending to use the barcode feature of the RFxxxM device within your standalone applications, remember to consult the device vendor's documentation about it. When working integrated in a SIMATIC RF-MANAGER configured environment, barcode scanning is a by-product gained automatically as you will see below.

2.3 Extending the Reach

2.3.1 Being Part of a Larger Family

The last chapter discussed using the handheld RFID reader interface in a standalone scenario. However, even RFID reader are not always alone in this world but have to interact – or want to interact – with other components in larger systems.

Being aware of this fact, the RFID reader interface now supports integrating into SIMATIC RF-MANAGER configured environments. Please bear in mind that both the communication and synchronization among devices and usage of configuration data relies on a working RF-MANAGER infrastructure. More precisely we are talking of integrating into a SIMATIC RF-MANAGER system only.

Consider an integration scenario as given in the figure below.

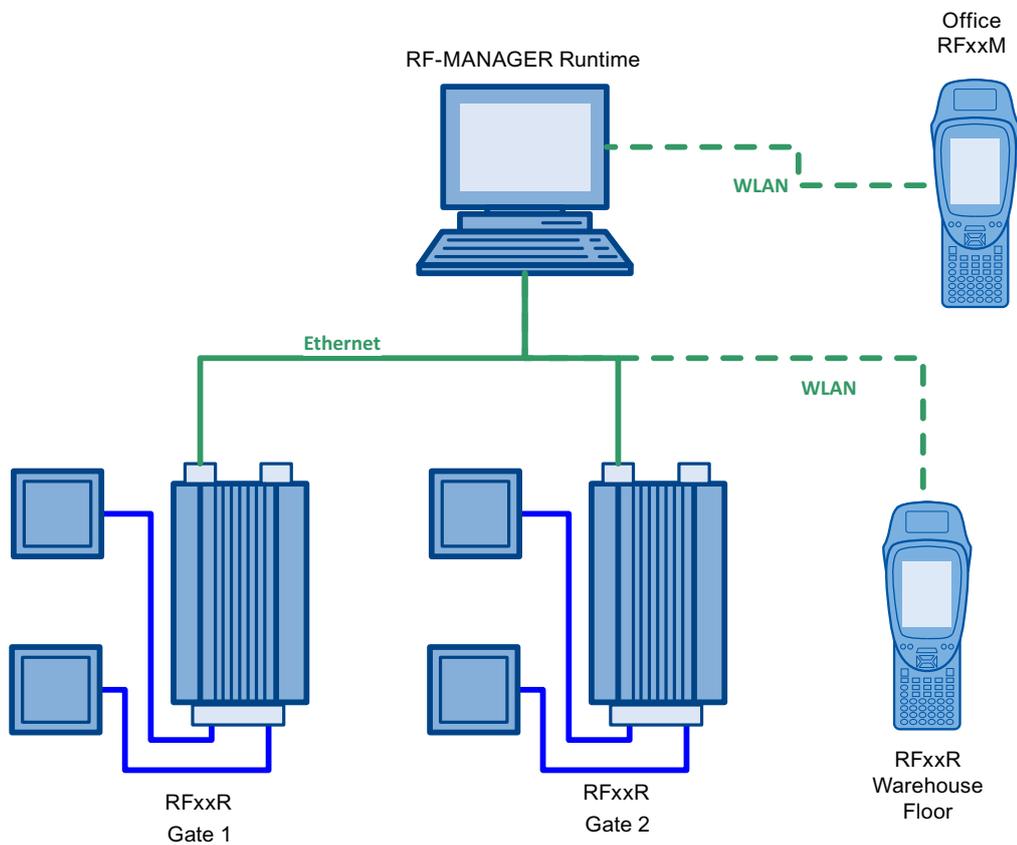


Figure 2-7 Larger Infrastructures

There are some stationary RF660R readers which are controlled by an RF-MANAGER runtime. Let's say, they check incoming and outgoing goods at warehouse gates. The whole system is set up using a configuration created with RF-MANAGER.

Now, Jerry – the guy working at the warehouse – wants to check if all the goods having been unloaded at the gate are still within the package now stored in aisle three of the warehouse. So he takes his RFxxxM device with him, walks up to the package in aisle three and scans the package again just for monitoring purposes.

Since Jerry realized there were some parts missing in the package, the supplier sent the missing parts right away in a second delivery by a parcel service. This second parcel, however, did not pass the gates but arrived directly at the office counter. There, Molly – the soul of the office – used another RFxxxM device to scan the ID of the delivered goods. Contrary to Jerry's scanning, the data she acquired was not only used for monitoring but as additional input to the system just as it would be a third gate.

However, Molly's desk is crowded as always and thus her scanning detects not only the tags of the new parcel but some others from nearby as well. She wants to forward only the new product IDs and skip the remaining known IDs that were scanned accidentally.

The story above shows two new use cases for the RFxxxM. We will go through both of them and discuss the implications to the usage of the RFID reader interface.

2.3.2 Entering the system

How do we achieve to be part of a larger system with an RFxxxM?

The good news is that starting with RF-MANAGER 2008 the RFxxxM can be configured within a project as just another reader. All you have to do is, setting the reader type to e. g. 'RF680M' and setting the IP address accordingly so that the RFxxxM can be reached via Ethernet. Of course you have to set up a WLAN connection to the device first.

Afterwards, you start the RFID reader using the already familiar interface member `StartReader` but specifying the RF-MANAGER mode as shown in the code snippet below.

```
private void menuReaderStart_Click(object sender, EventArgs e)
{
    try
    {
        // We want to create and start an instance of the RFID
        // reader interface for an RF610M device that interacts with
        // an RF-MANAGER runtime.
        RfReaderInitData initData = new(RfReaderInitData());
        initData.Type = „RF680M“;
        initData.Mode = RfReaderInitData.ReaderMode.RfMananger;

        // With RfReaderApi.Current we address the current
        // RFID reader interface instance
        // or initiate the creation of a new instance.
        // StartReader connects to an existing reader service
        // or creates a new reader service.
        RfReaderApi.Current.StartReader(initData);
    }
    catch (RfReaderApiException rfidException)
    {
        // Something went wrong while starting the reader.
        // More information is available by inspecting the
        // RfReaderApiException's members ResultCode, Error,
        // Cause and Description.
        ...
    }
}
```

As a result, the RFID reader interface starts the underlying reader service in such a way that it waits for a connection with an RF-MANAGER runtime. As long as no connection to an RF-MANAGER runtime has happened, you will not be able to perform any operations on the interface successfully apart from stopping, getting the version or adding an event handler.

Any try to call an API function while the connection to the RF-MANAGER is still pending will result in an `RfReaderApiInvalidModeException` exception.

Hold on a second! You won't tell me that after starting a reader the only thing that happens is that the interface is blocked, will you? That's crazy.

Well, actually it is not. And here is why: When working in RF-MANAGER integrated mode the reader service needs initialization data configured with RF-MANAGER in order to know for example if it has to scan only for RFID data or for barcodes and how the keys on the device trigger reading and whether the device is used for monitoring or for control. As long as this information is not available, the behavior of the RFID reader interface would be somehow random. To prevent clients from being confused by such indiscriminate behavior, the best way is to allow operation only, if system configuration has been finished.

2.3.3 Wake me up before you go...

So far, so good – we will wait until the configuration has been finished. But how do we know it has finished?

Luckily the RFID reader interface provides a notification mechanism which enables us as a client of the API to know what is going on. Let's have a closer look at what happens when a new configuration from RF-MANAGER arrives:

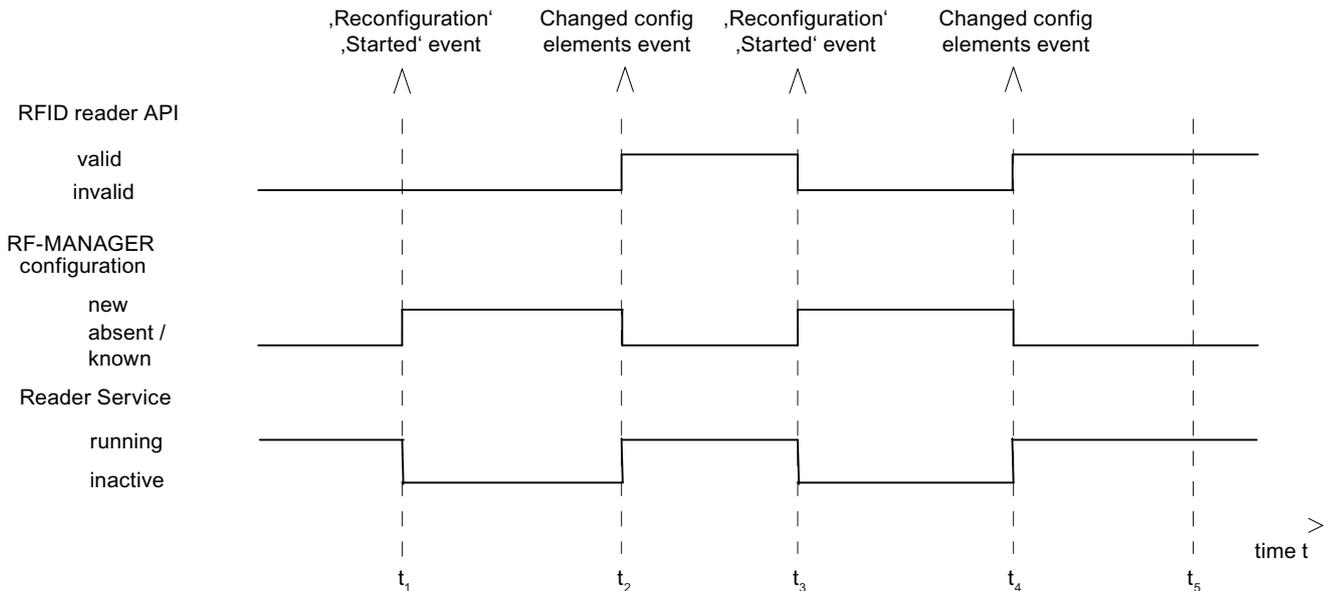


Figure 2-8 RFID Reader Interface

Whenever the reader service receives configuration data from a connected RF-MANAGER runtime it sends a "Reconfiguration:Started" notification telling you that it will now start reconfiguration (t_1 , t_3). At this point in time the interfaces changes to the invalid state and disables access. For you as a client this means, you should disable functions that use the interface until reconfiguration has finished.

After the reconfiguration of the system has finished, the RFID reader interface changes its state to valid and a second notification – containing either the changed configuration items as parameters or just "Reconfiguration: Nochange" – is sent (t_2 , t_4). Now, that is the trigger for an API client to start working with the RFID reader interface.

You can easily follow those conclusions, can't you? But what happens if no new configuration arrives because either a configuration is already available on the device or there has not been a connection to an RF-MANAGER runtime yet? Do we have to wait forever to detect these cases?

No, you don't. The reader service and as a consequence the RFID reader interface will always send a notification on startup as well. If there is *no* configuration available on the device the "Reconfiguration: Initial" event is sent. If a configuration is available you will either get the changed items or the "Reconfiguration: Nochange" event.

Bear in mind, however, that in those cases no "Reconfiguration:Start" event will be issued contrary to the arrival of new configuration data.

Nevertheless, this means, we can always rely on getting an event during startup – no matter what.

Great, we now know when we are started. Normally, you start an underlying reader service during startup of your client via `StartReader()` and you stop it again during shutdown of your client with the `StopReader()` function of the RFID reader interface causing the reader service to terminate as well.

If you shut down your client application without calling `StopReader()` first, the underlying reader service keeps running. The next time you start up your client and call `StartReader()`, no startup sequence of the reader service will occur because it is still running.

The downside of this behavior would be that you are again without a trigger to start working.

The good news is that the RFID reader interface knows that a reader service was already running before and initiates a "Reconfiguration : Reconnect" notification. So, you as a client can react and reinitialize your application.

And again, you can rely on always receiving an event during the RFID reader interface startup.

Back to practice

So much for the theory, now back to practice. The notification means of the RFID reader interface is its Alarms event. As a client you have to add an event handler best before you do anything else with the interface.

The alarm handler function has to comply with the following prototype that defines the special `RfAlarmArgs` parameters.

```
public void AlarmHandler(object sender, RfAlarmArgs alarmArgs)
```

Before starting the reader we add the alarm handler:

```
RfReaderApi.Current.Alarms += new RfAlarmHandler(this.AlarmHandler);
```

Now we are ready for take-off. We compile, deploy and run our test application to the RF610M and use our new "Start RF-MANAGER" menu item.

On a connected host PC we start a RF-MANAGER runtime with an RFxxxM device configured as follows. Notice that the reader type and the application mode have to be set accordingly.

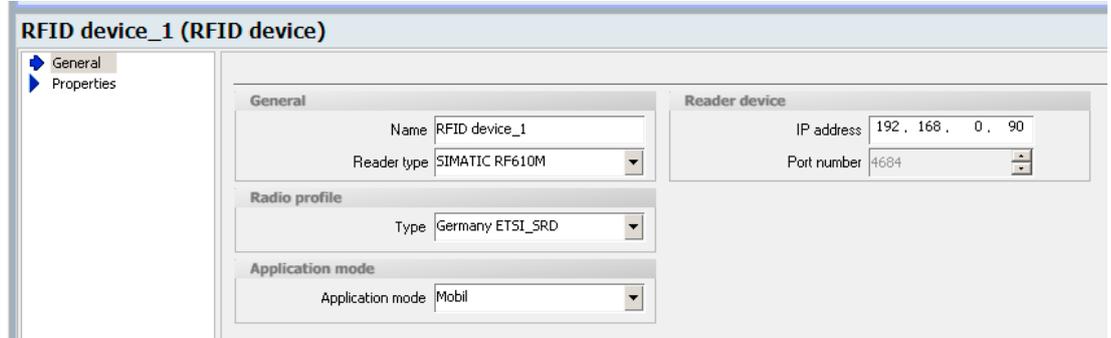


Figure 2-9 RF610M Properties

As a side note, please bear in mind to set the network address for your runtime under 'Device Settings, RFID/Network Settings'. This is needed as a 'callback' so that your RFxxxM devices is able to pass read tag data on to the RF-MANAGER runtime.

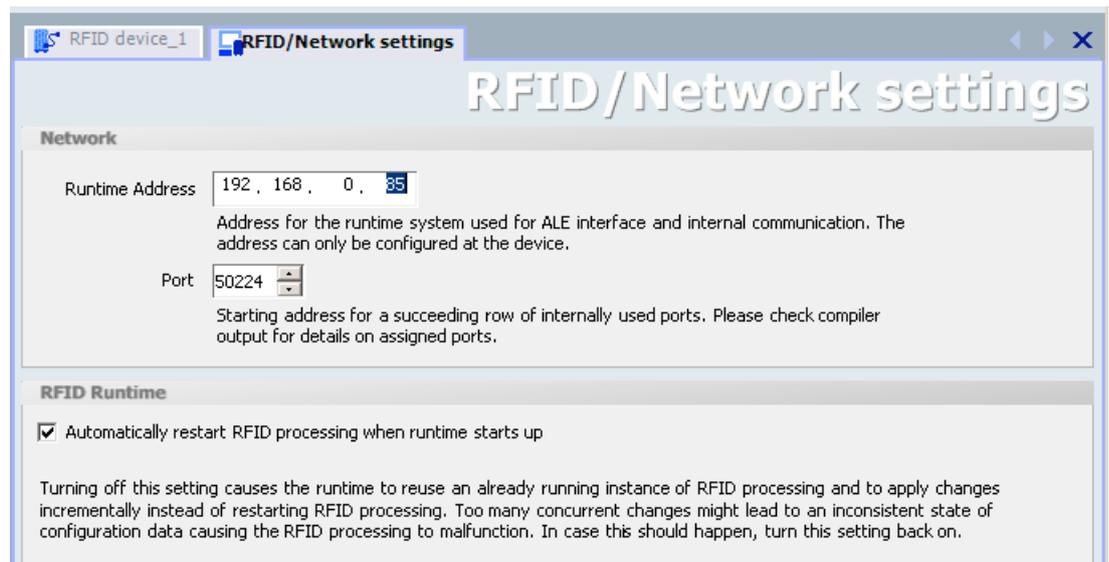


Figure 2-10 RFID Network Settings

When starting up our application on the RFxxxM and the RF-MANAGER runtime on the host PC our AlarmHandler is called three times. Fine!
Wait: Did you say three times?

Ok, when the RF-MANAGER configuration is transmitted to the RFxxxM device there will be the start reconfiguration event, which is signaled by the Boolean RfAlarmArgs member IsConfigStart as well.

And when reconfiguration is finished there will be another event containing a list of changed configuration items, which we deal with in a minute.

But what is the third time we are called? Just keep in mind the initial startup event that is created in all cases telling you if it was an initial startup or a reconnect and whether there is configuration data available.

Here is a skeleton alarm handler body that shows the different events:

```
public void AlarmHandler(object sender, RfAlarmArgs alarmArgs)
{
    if (alarmArgs.IsConfigStart)
    {
        // Reconfiguration has started
        // => disable UI
    }
    else if (alarmArgs.InfoItems != null)
    {
        // Reconfiguration has finished
        if (alarmArgs.InfoItems[0].Name == "Reconfiguration" &&
            alarmArgs.InfoItems[0].Value == "Initial")
        {
            // This is the very first startup of the application
            // where no configuration data is available
        }
        else if (alarmArgs.InfoItems[0].Name == "Reconfiguration"
            && alarmArgs.InfoItems[0].Value == "Reconnect")
        {
            // The reader service was already running and we
            // only reconnected => reinitialize, e.g by rereading
            // configuration data
        }
        else
        {
            // A configuration was received from RF-MANAGER and
            // has been activated.
            // => The list of RfInfoItems contains the changed
            // configuration items
        }
    }
    ...
}
```

2.3.4 We are started: What to make out of it?

Now the system is up and running and with the reconfiguration end event we got a list of changed configuration items. You missed them? No problem, because there is another possibility to query the configuration items. It's the RFID reader interface's GetConfigParameter member which allows you to ask the current value for any known parameter. In order to make it easier for you, the sample application implements a dialog for showing you the values of the configuration parameters.

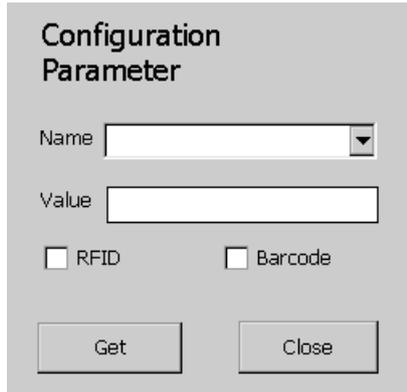


Figure 2-11 Configuration Parameter

In essence it uses a code sequence such as the following to ask for parameter values whereas parameterName is a string giving the parameter's id.

```
RfInfoItem infoItem =
    RfReaderApi.Current.GetConfigParameter(parameterName);
```

Here is a list of parameters that you can query:

Configuration Parameter Name	Possible Values / Description
MobileOperatingModeEnabled	This parameter tells you if the device is working in remote mode (FALSE) or mobile mode (TRUE). Whenever this parameter is false, you may only monitor tag events. Only if this parameter is true, filtering is enabled and tag events might be changed and can be fed in again with the SetTagEvents API function.
EditTagEnable	This parameter could be used by your applications. It signals that changing of tags is allowed inside your application.
ScanBeepEnable	Produce a sound on valid reads (if true).
ScanResultTime	The configured time
	All of the following configuration parameters give information on how certain triggers are configured. On the one hand they specify whether a configured trigger is only valid as long as the associated key is pressed (KEY_PRESSED) or whether the trigger implements an ON/OFF toggling (START_STOP). Moreover, depending on the configuration, each trigger is associated with either RFID scanning or barcode scanning or with both.
PistolGrip	Information about the pistol grip button
Scan Key Left	Information about the scan key button on the left of the device
Scan Key Right	Information about the scan key button on the right of the device

2.3 Extending the Reach

Configuration Parameter Name	Possible Values / Description
Scan Key Top	Information about the scan key button on top of the device
Application	Information about the virtual software trigger

Checking the parameter values from our default RF-MANAGER configuration, we find the following setup:

We are running in RF-MANAGER mode and we are only allowed to monitor tags but not to change them. All keys trigger as long as pressed and trigger RFID reading except for the pistol grip which is associated with barcode. And there is a software trigger available as well that we can use.

Comparing this setup with our introductory scenario it looks like it suffices to fulfill Jerry's requirements.

2.3.5 Jerry's tag monitoring scenario revisited

Let's start out by making our life easy: Before we deal with key handling we first explore the possibilities for software triggering. We now know that there is an application trigger connected with the internal RFID data source. So we start reading tags by just telling this trigger to work and here is how:

We add a new menu item that uses the RFID reader interface's function SetTrigger to change the state of the application trigger. As we learned from the configuration parameter settings this trigger acts as a on/off button and we take that into account by toggling the trigger's state with every invocation of the menu item (that is what our internal Boolean flag fAppTriggerState is for).

private void menuItemAppTrigger_Click(object sender, EventArgs e)

```
private void menuItemAppTrigger_Click(object sender, EventArgs e)
{
    ...
    RfTriggerState newTriggerState = RfTriggerState.On;
    if (this.fAppTriggerState)
    {
        newTriggerState = RfTriggerState.Off;
    }
    RfReaderApi.Current.SetTrigger(RfTriggerType.Application,
        newTriggerState);
    this.fAppTriggerState = !this.fAppTriggerState;
    ...
}
```

If we now start our test application, start the reader service in RF-MANAGER mode, wait until we got the 'API valid' event and then toggle our trigger while an RFID tag is within reach we can now see read tags.

You don't see them? Well, to be honest, so far you won't see any tags within our test application but you will see them within the connected RF-MANAGER runtime if you open a screen at runtime that shows an RFID view. This view shows the tag events we want to monitor.

While this is great for the guys in front of the RF-MANAGER runtime PC, it won't help our poor plant floor guy Jerry with its RFxxxM device because he still does not know whether the tags have been read or not.

So, next let's make sure that poor Jerry sees the read tags on his device as well.

2.3.6 I'm all ears

Scanning the RFID reader interface members, the most promising one for our purpose is the `TagEventNotifications` event. We add a handler to this event when starting the reader

```
private void menuReaderStartRfm_Click(object sender, EventArgs e)
{
    ...
    RfReaderApi.Current.TagEventNotifications +=
        new
RfNotificationHandler(rfmIntegration.NotificationHandler);
    ...
}
```

And we implement the handler after a quick look at the reference section on how to interpret the delivered data. For a starter we look at the tag ID, the event type and the time of occurrence.

```
public void NotificationHandler(object sender, RfNotificationArgs notificationArgs)
{
    if (null != notificationArgs.TagEvents)
    {
        foreach (RfTagEvent tagEvent in notificationArgs.TagEvents)
        {
            this.mainFormRef.WriteInformationLine("Tag Event: " +
                tagEvent.EventTimeUTC);
            this.mainFormRef.WriteInformationLine(" > ID : " +
                tagEvent.TagID);
            this.mainFormRef.WriteInformationLine(" > Type: " +
                tagEvent.EventType);
        }
    }
    else
    {
        this.mainFormRef.WriteInformationLine("Tag Event: No tags");
    }
}
```

Let's give it a try and run the code, start the reader service and the trigger.

Did you see any tags within your test application?

No?

You might ask yourself 'Why not? I used the very same code as with alarms and there it worked'. What is so different here?

The difference is that contrary to alarms, notifications about tag events are only delivered if a client subscribes at the reader service. Since such a subscription might cause heavy data traffic, this subscription is not done automatically- Only if a client requests the data it will be delivered.

2.3 Extending the Reach

OK, we know for sure, we need the data, so we add a subscribe menu item and as we are add it an unsubscribe item as well.

```
private void menuItemSubscribeMonitor_Click(
    object sender, EventArgs e)
{
    // Subscribe is only valid if we run in RF-MANAGER mode
    if (this.fRfmIntegrated)
    {
        // It does not make sense to subscribe twice
        if (!this.fSubscriptionActive)
        {
            try
            {
                // Subscribe for all possible data sources
                bool fResult = RfReaderApi.Current.SubscribeForNotifications(
                    RfReaderApi.NC_ALL, false);

                if (fResult)
                    this.fSubscriptionActive = true;
            }
            catch(RfReaderApiException rfidException)
            {
                ...
            }
        }
    }
}

private void menuItemUnsubscribeMonitor_Click(
    object sender, EventArgs e)
{
    ...
    if(this.SubscriptionActive)
    {
        // Subscribe for all possible data sources
        RfReaderApi.Current.UnsubscribeForNotifications(
            RfReaderApi.NC_ALL);
        this.fSubscriptionActive = false;
    }
    ...
}
```

As you can see by looking at the code snippets above, there is an SubscribeForNotifications member within the RFID reader interface.

It needs two parameter, the first one specifying the data source and the second whether we only want to monitor or to filter the tag event data. As we are still on the way to let Jerry monitor the tags, the second paramter is set to false.

For the first parameter we would have to know which data sources are configured within a project. Luckily, configurations for a RFxxxM do not allow too much variation on the data sources. They normally include an RFID and/or a barcode source only. Moreover, these data sources have fixed names which are provided via constants within the RFID reader interface. The following table lists possible values.

RfReaderApi.NC_RFID	This is the data source name if you want to target the RFID component
RfReaderApi.NC_BARCODE	This is the data source name if you want to target the barcode component
RfReaderApi.NC_ALL	This is a generic name that subscribes for all configured data sources within a project.

Most interesting here is the last constant which ensures that all available data sources are subscribed. Most often 'NC_ALL' is the safest option.

Running the application again now gives us what we wanted. Whenever we are not subscribed, toggling the trigger will show tag events only at the RF-MANAGER runtime.

As soon as we subscribe, tag events are also shown within our test application directly on the RFxxxM device. After unsubscribing tag events are still shown within the RF-MANAGER runtime but no longer within our test application.

We got it! Jerry can now monitor his tags.

2.3.7 Not without my approval

Now back to the office where Molly still wants to add the missing parcel to the original delivery. Using the device with an application such as that we created above doesn't really help. While it would be possible to scan new IDs and to forward them to a connected RF-MANAGER runtime there is no way of intercepting the data before it is delivered to the RF-MANAGER.

Here is where the second parameter of the `SubscribeForTagNotifications` function of the RFID reader interface comes to play. Whenever this parameter is set to true, scanned information is delivered to the subscribed client (i.e. our application) but not yet to a connected RF-MANAGER.

Forwarding of the data to the RF-MANAGER runtime will not occur until the RFID reader interface member `SetTagEvents` is called with a list of tag events to be passed on.

Having the said facts about filtering in mind, subscribing and unsubscribing for our Molly scenario is just a duplicate of what we already have whereas only the filtering parameter is changed.

```
private void menuItemSubscribeFilter_Click(
    object sender, EventArgs e)
{
    ...
    // Subscribe for all data sources with filtering (!)
    bool fResult = RfReaderApi.Current.SubscribeForNotifications(
        RfReaderApi.NC_ALL, true);
    ...
}
```

In order to make it easier for us to test our code we introduce another new function that allows us to simulate the pressing of a key where acquiring data only happens as long as the key is pressed.

This is achieved by setting a corresponding trigger to ON, waiting for a second and setting the trigger to OFF again. Here is the code for our new 'simulate key' function

```
private void menuItemSimulateKey_Click(
    object sender, EventArgs e)
{
    ...
    // Pretend we pressed the top key
    RfReaderApi.Current.SetTrigger(RfTriggerType.ScanTop,
        RfTriggerState.On);

    // Hold the key for a second
    Thread.Sleep(1000);
    // 'Release' the key again
    RfReaderApi.Current.SetTrigger(RfTriggerType.ScanTop,
        RfTriggerState.Off);
    ...
}
```

Starting our application, starting the reader, subscribing as mentioned above and using our new trigger method will result in the scanned tag data to appear within our notification handler.

We store incoming tag events in a list of tag events for later delivery

```
public void NotificationHandler(object sender, RfNotificationArgs
    notificationArgs)
{
    ...
    if (null != notificationArgs.TagEvents)
    {
        foreach (RfTagEvent tagEvent in notificationArgs.TagEvents)
        {
            // Remember this tag event when filtering for later
            // confirmation
            this.bufferedTagEvents.Add(tagEvent);
        }
    }
    ...
}

// This is our internal list to store tag events
private List<RfTagEvent> bufferedTagEvents = new List<RfTagEvent>();
```

Remember that as long as we are scanning, all acquired data is only stored locally on your RFxxxM device. A connected RF-MANAGER runtime will not see a single one of the scanned tags.

Now we can present the buffered tags to an end user such as Molly. If she confirms that all shown tag events are valid, we can forward them to the RF-MANAGER runtime by calling the SetTagEvents function as shown below:

```
public void ConfirmTagEvents()
{
    ...
    if (this.bufferedTagEvents.Count > 0)
    {
        RfReaderApi.Current.SetTagEvents(RfReaderApi.NC_RFID,
            this.bufferedTagEvents.ToArray());
    }
    ...
}
```

Notice that the second parameter for the SetTagEvents function is just a list of tag events. In the code above, simply all buffered tag event items are passed on to the function. The only other information needed is the name of the data source within our reader service that will receive the tag events. Again, we can safely rely on the system's default component names and use the given constant RfReaderApi.NC_RFID.

Contrary to subscribing for tag event notifications – where we simply used NC_ALL – we are not allowed to use a generic name such as 'all' here but we have to address a specific data source.

Running the code above now passes on the read tag events to the connected RF-MANAGER runtime.

As said in our case the whole list of tag events. However, nothing prevents you from selecting only some of the tag events, deleting events, adding your own tag events or changing the values of a tag event before handing it over to the SetTagEvents function.

That way you can allow 'Molly-like' filtering for example by providing all tag events in a list and letting the user select those events to be passed on.

And voila! We are able to make both Jerry and Molly happy again.

2.3.8 Make it fun: Working keys

Finally, let's get back to the trigger keys – remember your RFxxxM device has plenty of it, on the left on the right, a big one on top and a pistol grip trigger (if you have a device equipped with a barcode unit).

Capturing keyboard input as such is easy: We only have to add an event handler to the main form's keydown event. And since we want to know when the key is released again we also add an event handler to the keyup event. The simple code is shown below.

```
...
// Main Form initialization code
this.KeyDown += new System.Windows.Forms.KeyEventHandler(
    this.KeyDownHandler);
this.KeyUp += new System.Windows.Forms.KeyUpHandler(
    this.KeyDownHandler);
...
```

However, this code will only work as long as the main form has the focus. Whenever a control residing on this main form has the focus, we will not get the key events. Therefore, our demo application uses a simply 'intercept all controls' mechanism starting at the main form. The main form's constructor invokes `CaptureKeys(this)`.

```
protected void CaptureKeys(Control control)
{
    for (int i = control.Controls.Count - 1; i >= 0; i--)
    {
        Control c = control.Controls[i] as Control;
        if (c != null)
        {
            c.KeyDown += new System.Windows.Forms.KeyEventHandler(
                this.KeyDownHandler);
            c.KeyUp += new System.Windows.Forms.KeyEventHandler(
                this.KeyUpHandler);
            CaptureKeys(c);
        }
    }
}
```

Now, we only have to check for the right keycode and invoke the correct trigger function.

Initially, all of the special keys produce the same keycode 0xEF or 239 decimal. So, whenever such a code arrives with a key down event, we set our trigger to active. And if the key is released again, we reset the trigger. That way we implemented a simple 'scan as long as key is pressed' behavior.

```
protected void KeyDownHandler(object sender, KeyEventArgs e)
{
    if (e.KeyValue == 0xEF)
    {
        ...
        // (Error handling code omitted for the sake of clarity
        RfReaderApi.Current.SetTrigger(RfTriggerType.Application,
            RfTriggerState.On);
        ...
    }
}
protected void KeyUpHandler(object sender, KeyEventArgs e)
{
    if (e.KeyValue == 0xEF)
    {
        ...
        // (Error handling code omitted for the sake of clarity
        RfReaderApi.Current.SetTrigger(RfTriggerType.Application,
            RfTriggerState.Off);
        ...
    }
}
```

That is all you need to attach keys to function. Piece of cake, isn't it?

Let's add some cream on top of it. What if you do want to distinguish among all of those scan keys. It is not always desirable using the same function for all keys. But if they all send the same keycode it is impossible.

Luckily, PSION provides a way to change this. There is an interface assembly PsionTeklogixNet.dll that offers you a PsionTeklogix.Keyboard namespace containing a KeyRemapper class. This class allows redefining the keycodes. So we add some initialization code in our main form's constructor as shown below

```
...
// Initialize key mapping
PsionTeklogix.Keyboard.KeyRemapper Rf610MKeyRemapper =
    new KeyRemapper();
// left scan key
Rf610MKeyRemapper.Add(0x38, null,
    PsionTeklogix.Keyboard.Function.SendCode,
    (int)PsionTeklogix.Keyboard.VirtualKey.VK_F27);
// right scan key
Rf610MKeyRemapper.Add(0x39, null,
    PsionTeklogix.Keyboard.Function.SendCode,
    (int)PsionTeklogix.Keyboard.VirtualKey.VK_F25);
// Pistol Grip
Rf610MKeyRemapper.Add(0x3A, null,
    PsionTeklogix.Keyboard.Function.SendCode,
    (int)PsionTeklogix.Keyboard.VirtualKey.VK_F26);
// top scan key
Rf610MKeyRemapper.Add(0x01, null,
    PsionTeklogix.Keyboard.Function.SendCode,
    (int)PsionTeklogix.Keyboard.VirtualKey.VK_F28);
...
```

2.3 Extending the Reach

These calls to `PsionTeklogix.Keyboard.KeyRemapper` select the key in question with the first parameter and provide new keycodes with the last parameter. After this initialization we can rewrite our keyhandler as follows:

```
protected void KeyDownHandler(object sender, KeyEventArgs e)
{
    switch (e.KeyValue)
    {
        ...
        case (int)PsionTeklogix.Keyboard.VirtualKey.VK_F25:
            // right scan key pressed
            ...
            break;

        case (int)PsionTeklogix.Keyboard.VirtualKey.VK_F26:
            // pistol grip key pressed
            ...
            break;
        case (int)PsionTeklogix.Keyboard.VirtualKey.VK_F27:
            // left scan key pressed
            ...
            break;
        case (int)PsionTeklogix.Keyboard.VirtualKey.VK_F28:
            // top scan key pressed
            ...      break;
        ...
    }
}
```

Now we know which key was pressed and can implement a different behavior for each of them if wanted.

The key mapping stays active until a cold reset, a redefinition or if we manually remove the key mapping again. As we want to leave the system as clean as we found it, we undo our key mapping before exiting:

```
...
// Make our key mapping undone again
PsionTeklogix.Keyboard.KeyRemapper Rf610MKeyRemapper =
    new KeyRemapper();
Rf610MKeyRemapper.Remove(0x38, null);
Rf610MKeyRemapper.Remove(0x39, null);
Rf610MKeyRemapper.Remove(0x3A, null);
Rf610MKeyRemapper.Remove(0x01, null);
...
```

2.3.9 Summary

This chapter provided a short overview of the possibilities that the RFID reader interface offers when working in integrated scenarios where most of the configuration is done with RF-MANAGER and custom applications on a mobile device such as the RF610M need to tweak the system behavior a little.

You are now familiar with the basics of monitoring and filtering of tag events. You know how to eliminate unwanted data or even create data artificially.

You learned about the possibilities to find out what is configured under the hood by exploring the configuration parameters and about the considerations necessary when starting up or shutting down.

This manual can in no way cover all aspects and details of creating client applications. It is intended as a jump start into the realm of tag event processing.

Additional topics such as connecting keys to triggers or something similar are left for your own exploration.

Build on the basics you learned and adjust them to fit your needs to 'Extend your Reach'.

RFID Reader Interface Reference

The RFID Reader Interface provides a way to access the RFID features that the handheld device provides. End users can utilize these features by using the DLL interface which is provided as a .Net assembly within own client applications.

This chapter provides a detailed description of all available functions and their parameters.

3.1 The Interface

The programming interface is contained in a .Net assembly with the name Siemens.Simatic.RfReaderApi.dll. Whenever clients want to use the interface, they must reference this assembly in their applications.

This assembly contains the defining and implementing classes in a namespace Siemens.Simatic.RfReader.

There are a few helper classes, the interface itself and a static function to instantiate an instance of the RFID Reader Interface.

Starting with RFID Reader Interface V1.1 notifications and alarms are supported which led to some new helper classes

Supported in RFID reader interface: since v1.0	
RfReaderApiException	Helper class to wrap exception information
RfReaderInitData	Helper class for initialization purposes
IRfReaderApi	The interface class
RfReaderApi	Creation of an RFID Reader Interface instance

Supported in RFID reader interface: since V1.1	
RfNotificationArgs	Helper class that wraps arguments for notification events
RfTagEvent	Helper class that contains all data of a single tag event
RfAlarmArgs	Helper class that wraps argument for alarm events
RfAlarm	Helper class that contains all data of a single alarm
RfInfoltem	Helper class that contains information about configuration or state changes

[RF310M device is supported with reader interface V1.2](#)

[RF680M device is supported with reader interface V1.3](#)

The following chapters describe each member of the interface in detail including its parameters and return.

3.2 RfReaderApi.Current

```
RfReaderApi.Current : IRfReaderApi {get}
```

Parameters:

None (.Net Property)

Return value(s):

This function returns the current instance of an RFID Reader interface or null.

Note:

If no instance has been created before, a call for this function will create a new RFID Reader Interface instance.

If there is already an instance of the RFID Reader Interface running, it will be returned.

Should it not be possible to create an instance of the RFID Reader Interface, null will be returned.

3.3 RfReaderApiException

Whenever RFID reader API related exceptions occur either internally or by calling the underlying reader service or the physical RFID reader device, these exceptions are wrapped within an instance of the RfReaderApiException class.

However, this does not prevent general exceptions such as 'out of memory' or 'out of range' to occur either. So, be prepared to catch those kind of exceptions as well.

This class provides additional information about the source or cause of an exception via the following members:

- `ResultCode : int`
The `ResultCode` specifies the source location of an exception.
`ResultCode_System` specifies error conditions which occurred internally.
`ResultCode_Reader` specifies error conditions arising from within an underlying reader service.
- `Error : string`
Error is a short description of the error that occurred.
- `Cause : string`
Cause gives additional information if the cause of an error is known.
- `Description : string`
Additional extra description of the error. May be left blank if not applicable.

3.4 IRfReaderApi

3.4.1 Version

```
IRfReaderApiVersion : string {get}
```

Parameters

None (.Net Property)

Return value(s)

The current version of the interface and its implementation as a string formatted as 'Vmj.mn.sp.hf_i1.i2.i3.i4' whereby mj and mn are the major and minor version of the product, sp specifies a service pack number and hf a hotfix number.

All of the four following numbers (i1, i2, i3, i4) are internal identifiers qualifying a special release or build of the RFID reader interface assembly.

Note

This information can be used to determine which features are supported by a certain version of the RFID Reader Interface. When checking for function compatibility using the major and the minor version is sufficient.

A sample version number is "V01.01.00.00_01.12.00.01".

Version information

Supported in RFID Reader Interface: since V1.0

3.4.2 StartReader

```
StartReader( initData : RfReaderInitData ) : void
```

Parameters

initData

Information about how to configure the reader and how to establish the connection. Information is given within the following RfReaderInitData structure:

RfReaderInitData Member	Description
Mode	Specifies whether the underlying reader service works in standalone mode (RfReaderInitData.ReaderMode.Standalone) or integrated in an RF-MANAGER configured environment (RfReaderInitData.ReaderMode.RFManager)
Name	Specifies a name for the reader service. This parameter is not needed in RfManager mode and is always set to a default value.

3.4 IRfReaderApi

RfReaderInitData Member	Description
Address	Set the IP address for the device. This value defaults to 127.0.0.1 which is the local device.
Port	The port which is used for communication between the API and the underlying reader service. Defaults to 4684, which is the EPC default port.
Type	Supported Types: - RF310M ¹⁾ - RF610M - - RF680M ²⁾ Default is RF610M. Any other type will be refused
AdditionalInitData	Additional initialization data for other readers. Currently always empty. (This member is provided for future use)

1) since Reader interface V1.2

2) since Reader Interface V1.3

Return value(s)

None

Exceptions

ArgumentOutOfRangeException	Validation of the contents of initData failed. Check the values provided.
RfReaderApiException	Error while starting the communication with the reader. Check the Error member for more information.

Note

Initiates the communication to an underlying reader service application that manages the physical RFID reader device.

Most often you only need to specify only a single parameter when instantiating RfReaderInitData, which is the mode that specifies whether the RFID reader interface should be used from a standalone application or within an RF-MANAGER configured system.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.3 StopReader

`StopReader() : void`

Parameters

None

Return value(s)

None

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

Stops the communication with an underlying reader service application, terminates and unloads the service.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.4 ReaderStatus

ReaderStatus : Hashtable {get}

Property

A hash table that contains name values. The parameter names are used as keys.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

Returns information about the state of the reader as a list of name values within a hash table. Currently supported entries are:

ReaderModel	Returns the current model Valid values are : 'RF610 EU' for the European version of RF610M 'RF610M US' for the American version. Of RF610M 'RF680M ETSI' for the European version of RF680M 'RF680M FCC' for the American version of RF680M 'SIMATIC RF310M'
ComPort	The communication port used
ReaderFirmware	The version identifier of the RFID module's firmware
ReaderServiceVersion	The version of the reader service (since V1,2)

3.4 IRfReaderApi

ReaderHWVersion	The hardware version of the RFID modul (RF310M only)
ReaderLoaderVersion	The version of the RFID modul (RF310M only)
ErrorCounter	The error counter of the RFID modul (RF310M only)
AbortCounter	The abort counter of the RFID modul (RF310M only)
CodeErrorCounter	The code error counter of the RFID modul (RF310M only)
SignaturErrorCounter	The signatur error counter of the RFID modul (RF310M only)
CRCErrrorCounter	The CRC error counter of the RFID modul (RF310M only)

Version information

Supported in RFID Reader Interface:since V1.0

3.4.5 AirProtocol

AirProtocol : string {get, set}

Property

A string identifying the current or desired air protocol

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

Sets a new air protocol type or returns the air protocol type currently in use. Valid protocol types are:

- EPCC1G2
- ISO18000-6B
- RF300
- ISO15693

Remember that not all functions are supported for all protocol types and that there may be restrictions on the data ranges.

KillTag and LockEPCGen2Tag are only supported for the EPCC1G2 protocol. Invoking these functions while another protocol e.g. ISO18000-6B is set will result in an exception.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.6 SetAirProtocol

```
SetAirProtocol( protocolName : string, initialQ : int) : void
```

Parameters

- **protocolName**
A string specifying the air protocol to be set.
- **initialQ**
An integer value that denotes the initialQ value used for collision detection with EPC Class1 Gen 2 tags.
This parameter is ignored if an air protocol other than 'EPCC1G2' is specified.

Return value(s)

None

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

This method is an alternate choice instead of the AirProtocol property described earlier. In contrast to the property, it allows an additional parameter (initialQ) to be specified for the EPC Class1 Gen2 protocol.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.7 SetAntennaPower

```
SetAntennaPower (power : uint) : void
```

Parameters

- **power**
The antenna power in mW.

Return value(s)

None

Exceptions

RfReaderApiException	Error while starting the communication with the reader. Check the Error member for more information.
----------------------	--

Note

The handheld devices have limited settings for the antenna power:
Valid ranges for the RF680M are: 10, 25, 50, 100, 200, 300, 400 and 500 mW;

Due to physical limitations, the device could also not set exactly the requested value, but choose the nearest possible value. So you could try to set the antenna power to 100mW but the device may return only 98mW.

Version information

Supported in RFID Reader Interface since V1.3

3.4.8 GetAntennaPower

`GetAntennaPower() : uint`

Parameters

None

Return value(s)

This functions returns the current antanna power.

Exceptions

RfReaderApiException	Error while starting the communication with the reader. Check the Error member for more information.
----------------------	--

Note

The handheld devices have limited settings for the antenna power:
Valid ranges for the RF680M are: 10, 25, 50, 100, 200, 300, 400 and 500 mW;

Due to physical limitations, the device could also not set exactly the requested value, but choose the nearest possible value. So you could try to set the antenna power to 100mW but the device may return only 98mW.

Version information

Supported in RFID Reader Interface since V1.3

3.4.9 SetCommunicationScheme

`SetCommunicationScheme (communicationScheme: uint) : void`

Parameters

- `communicationScheme`
The profile ID of the modulation schema.

Return value(s)

None

Exceptions

RfReaderApiException	Error while starting the communication with the reader. Check the Error member for more information.
----------------------	--

Note

The modulation scheme defines the data exchange rate between reader and tag. The possible modulation scheme depends on the used radio profile ETSI or FCC. Valid ranges for the RF680M are:

FCC :

- 2 = DSB-ASK 40kHz- FM0 40kHz
- 4 = DSB-ASK 160kHz- FM0 400kHz
- 6 = PR-ASK 40kHz - M4 250kHz
- 8 = PR-ASK 40kHz - M2 250kHz

ETSI:

- 2 = DSB-ASK 40kHz- FM0 40kHz
- 5 = DSB-ASK 40kHz - M2 160kHz
- 6 = PR-ASK 40kHz - M4 250kHz
- 7 = PR-ASK 40kHz - M4 300kHz

Version information

Supported in RFID Reader Interface since V1.3

3.4.10 GetCommunicationScheme

```
GetCommunicationSchema( ) : uint
```

Parameters

None

Return value(s)

This functions returns the current communication scheme of the reader.

Exceptions

RfReaderApiException	Error while starting the communication with the reader. Check the Error member for more information.
----------------------	--

Note

The modulation scheme defines the data exchange rate between reader and tag. The possible modulation scheme depends on the used radio profile ETSI or FCC. Valid ranges for the RF680M are:

FCC :

2 = DSB-ASK 40kHz- FM0 40kHz

4 = DSB-ASK 160kHz- FM0 400kHz

6 = PR-ASK 40kHz - M4 250kHz

8 = PR-ASK 40kHz - M2 250kHz

ETSI:

2 = DSB-ASK 40kHz- FM0 40kHz

5 = DSB-ASK 40kHz - M2 160kHz

6 = PR-ASK 40kHz - M4 250kHz

7 = PR-ASK 40kHz - M4 300kHz

Version information

Supported in RFID Reader Interface since V1.3

3.4.11 SetChannelList

SetChannelList (channelList: string) : void

Parameters

- channelList
Set used ETSI channels. Coma separated list. Valid channels are 103,106,109,112. At minimum one channel must be defined.

Return value(s)

None

Exceptions

RfReaderApiException	Error while communicating with the reader. Check the Error member for more information.
----------------------	---

Note

ETSI channels are only relevant for reader with ETSI profile.

While the RF680M supports no frequency hopping only one channel must be defined. Otherwise the function will rise a RfReaderApiException.

Version information

Supported in RFID Reader Interface since V1.3

3.4.12 GetChannelList

```
GetChannelList ( ) : string
```

Parameters

None

Return value(s)

This function returns the used ETSI channels as a coma separated list. Valid channels are 103,106,109,112.

Exceptions

RfReaderApiException	Error while starting the communication with the reader. Check the Error member for more information.
----------------------	--

Note

ETSI channels are only relevant for reader with ETSI profile.

Version information

Supported in RFID Reader Interface since V1.3

3.4.13 SetTagID

```
SetTagID(currentTagID : string, newTagID : string, password :string) : void
```

Parameters

- **currentTagID**
The ID of a tag to be written given as a hexadecimal encoded string (i.e., each byte is represented by a two-letter hexadecimal number).
- **newTagID**
The new ID to be written given as a hexadecimal encoded string (i.e., each byte is represented by a two-letter hexadecimal number).
- **Password**
An access password if needed. If none needed use an empty string. A password is a hexadecimal encoded string of up to eight characters.

Return value(s)

None

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

This method writes a new tag ID to an existing tag.
A valid tag ID must be specified for a tag currently within the field before you can write a new ID, or if no tag ID is specified, the first tag within the field will be written.
All tag IDs are given in a plain hexadecimal encoded string (i.e., each byte is represented by a two-letter hexadecimal number).
When writing an EPC class1 Gen2 tag, the password is verified for access rights. No passwords are required for writing an ISO tag. Please provide an empty string.
RF300 device does not support writing of Tag iDs at all

Version information

Supported in RFID Reader Interface: since V1.0

3.4.14 GetTagIDs

GetTagIDs() : string[]

Parameters

None

Return value(s)

Returns an array of strings that contains the read tag IDs. The tag IDs are returned in a plain hexadecimal encoded string (i.e., each byte is represented by a two-letter hexadecimal number).

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

This method executes a read operation on the reader and returns the IDs of all the recognized tags as an array of strings.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.15 GetTagMemory

```
GetTagMemory(tagID : string, memoryBank : uint,  
             startAddress : uint, dataLength : uint,  
             password :string) : byte[]
```

Parameters

- tagID
The ID of a tag whose data are to be read, given as a hexadecimal encoded string. (i. e. each byte is represented by a two-letter hexadecimal number).
- memoryBank
The memory bank (0 - 3) from which to read data.
Valid Values for the air protocol 'ISO18000-6B,'
0 – USER MEM

Valid values for the air protocol 'EPCC1G2' are:

- 0 – Reserved
- 1 – EPC,
- 2 – TID and
- 3 – USER MEM.

Valid values for the air protocol 'RF300' are:

- 0 – Memory

Valid values for the air protocol 'ISO15693' are:

- 0 – Memory

- startAddress
The base address within the memory bank from which to read data.
Base addresses are specified in bytes.
- dataLength
The length in bytes of the data to be read.
- Password
An access password if needed. The ISO18000-6B protocol e.g. does not support a password. So just pass an empty string.
A password is a hexadecimal encoded string of up to eight characters.

Return value(s)

An array of bytes containing the specified tag memory's contents.
In case of errors null is returned.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

Reads tag data whereby both internal and user-specific areas may be accessed.

A valid tag ID must be specified for a tag currently within the field before you can read data, or if no tag ID is specified, the first tag within the field will be read.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.16 SetTagMemory

```
SetTagMemory(tagID : string, memoryBank : uint,
             startAddress : uint, dataLength : uint,
             password :string, buffer : byte[]) : void
```

Parameters

- tagID
The ID of a tag whose data are to be modified, given as a hexadecimal encoded string.
- memoryBank
The memory bank (0 - 3) to which data are to be written.
Valid Values for the air protocol 'ISO18000-6B,'
0 – USER MEM

Valid values for the air protocol 'EPCC1G2' are:
0 – Reserved
1 – EPC,
2 – TID and
3 – USER MEM.

Valid values for the air protocol 'RF300' are:
0 – Memory

Valid values for the air protocol 'ISO15693' are:
0 – Memory
- startAddress
The base address within the memory bank to which data are to be written.
Base addresses are specified in bytes.
- dataLength
The length in bytes of the data to be written.
- Password
An access password if needed. The ISO18000-6B e.g. protocol does not support a password. So just supply an empty string.
A password is a hexadecimal encoded string of up to eight characters.
- Buffer
The data to be written as a stream of bytes.

Return value(s)

None.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

Writes tag data whereby both internal and user-specific areas may be accessed.

RF310 specific banks UID and CONFIG Data are not writeable, and will return with error exception.

A valid tag ID must be specified for a tag currently within the field before you can write data, or if no tag ID is specified, the first tag within the field will be written.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.17 GetTagStatus

GetTagStatus(tagID: string) : Hashtable { }

Parameters

- tagID**
 The ID of a tag whose status is to be read as a plain hexadecimal encoded string (i.e., each byte is represented by a two-letter hexadecimal number)

Return value(s)

A hash table that contains named values. The parameter names are used as keys.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

A valid tag ID must be specified for a tag currently within the field before you can get the status data, or if no tag ID is specified, the first tag within the field will be read

Returns information about the state of the tag as a list of named values within a hash table. Currently supported entries are:

TagType	Valid values for the air protocol RF300 are: <ul style="list-style-type: none"> RF300 Valid values for the air protocol ISO15693 are: <ul style="list-style-type: none"> ISO15693
MemorySize	Returns the size of memory in Byte For RF300 Tags this is only the size of the FRAM

LockBit Register	<p>Returns a Byte: the LockBit Register value.</p> <p>Block: 7 6 5 4 3 2 1 0</p> <p>Bit 7 6 5 4 3 2 1 0</p> <table style="margin-left: 100px; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> </tr> </table> <p>Schreibschutz-Status: 0 = Block nicht geschützt 1 = Block geschützt</p> <p>Adresszuordnung: Block 0 : FF80...FF83 Block 1 : FF84...FF87 Block 2 : FF88...FF8B Block 3 : FF8C...FF8F Block 4 : FF90...FF93 Block 5..7 reserviert</p>								
ASICVersion	Returns the Version string of the tag ASIC								
BlockSize	Returns the BlockSize of the Transponder								
NumberOfBlocks	Returns the number of Blocks of the Transponder Only valid for ISO15693 Tags								
TagID	The ID of a tag								

Limitations

This function is only valid when the protocol type is set to RF300 or ISO15693
Invoking this function while an other protocol is set e.g ISO18000-6B will result in an exception.

Version information

Supported in RFID Reader Interface: since V1.2

3.4.18 InitTagMemory

```
InitTagMemory(TagID : string, memoryBank : uint, startAddress : uint,
dataLength : uint, password : string, initData : byte) : void
```

Parameters

- TagID
The ID of a tag to be initialized, given as a hexadecimal encoded string (i.e., each byte is represented by a two-letter hexadecimal number).
- memoryBank
Valid values for the air protocol 'RF300' are:
0 – Memory

Valid values for the air protocol 'ISO15693' are:
0 – Memory
- startAddress
The base address within the memory bank to which data are to be written.
Base addresses are specified in bytes.
- dataLength
The length in bytes of the data to be written.
- Password
An access password if needed. If none needed use an empty string. A password is a hexadecimal encoded string of up to eight characters.
- initData
The data to be initialized.

Return value(s)

None.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

A valid tag ID must be specified for a tag currently within the field before you can initialize it, or if no tag ID is specified, the first tag within the field will be initialized.

Initializes all writeable tag data with the given data.

Limitations

RF680M and RF610M device does not support initializing of tags at all

Version information

Supported in RFID Reader Interface: since V1.2

3.4.19 KillTag

```
KillTag(tagID : string, password :string) : void
```

Parameters

- tagID
The ID of a tag which is to be killed, given as a plain hexadecimal encoded string.
- Password
An access password if needed. If none needed use an empty string.
A password is a hexadecimal encoded string of up to eight characters.

Return value(s)

None.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

Kills a tag with the given ID (i.e., the tag can no longer be used).

Limitations

This function is only valid when the protocol type is set to EPCC1GEN2.
Invoking this function while another protocol is set , e.g. ISO18000-6B, will result in an exception.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.20 LockEPCGen2Tag

```
LockEPCGen2Tag(tagID : string, epcGen2LockAction :  
string epcGen2LockMask : string password :string) : void
```

Parameters

- tagID
The ID of a tag which is to be locked, given as a plain hexadecimal encoded string.
- epcGen2LockAction
The lock action is a binary string as defined in the EPC Radio Frequency Identity Protocols Standard Specification.
The action is a value ranging from 000 to 11 1111 1111.
If the length of the lockAction is less than 10 characters (e.g., 111), the value defines the MSB (i. e. it is interpreted as 11 1000 0000).
- epcGen2LockMask
The lock mask is a binary string as defined in the EPC Radio Frequency Identity Protocols Standard Specification.
The mask is a value ranging from 000 to 11 1111 1111.
If the length of the lockMask is less than 10 characters (e.g., 11), the value defines the MSB (i. e. it is interpreted as 11 0000 0000).
- Password
A kill password if needed. If none needed use an empty string.
A password is a hexadecimal encoded string of up to eight characters.

Return value(s)

None.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

Use this command to lock an EPC class1 Gen2 tag on a logical reader.
The tag is locked at the source in which the tag is currently located.
If the given ID is an empty string, all RFID tags in the field of the logical reader will be locked.

Below is a short description of the parameters `epcGen2LockAction` and `epcGen2LockMask`.
The first line of the table ("Bit") defines the bit positions of the action and the mask values.
The mask and action values are given with the MSB first.

Bank	Kill PWD		Access PWD		EPC Memory		TID Memory		User Memory	
Bit	9	8	7	6	5	4	3	2	1	0
Mask	s/w	s/w	s/w	s/w	s/w	s/w	s/w	s/w	s/w	s/w
Action	r/w	p	r/w	p	w	p	w	p	w	p

The mask value determines which of the action value bits should be applied as shown in the table above as s/w (skip/write with skip=0 and write=1).

The action value determines how the bank should be locked for each memory bank.

The flag r/w defines a password lock for read/write.

The flag w defines a password lock for write (read access allowed).

The p flag defines a permanent lock.

The following tables list possible combinations of r/w and w flags with p flags and their combined meanings for one memory bank.

The tag is in the open state if it is identified and in the secured state if its access password is verified.

w	p	Description
0	0	Associated memory bank can be write-accessed from either open or secured state.
0	1	Associated memory bank can be permanently write-accessed from either open or secured state and can never be locked.
1	0	Associated memory bank can be write-accessed from the secured state but not from the open state.
1	1	Associated memory bank cannot be write-accessed from any state.

r/w	p	Description
0	0	Associated password location can be read and write-accessed from either open or secured state.
0	1	Associated password location can be permanently read and write-accessed from either open or secured state and can never be locked.
1	0	Associated password location can be read and write-accessed from the secured state but not from the open state.
1	1	Associated memory bank cannot be read or write-accessed from any state.

Example

Bank	Kill PWD	Access PWD	EPC Memory	TID Memory	User Memory	Hex String Value
Mask	(00)1 1	1 1	1 1	0 0	0 0	3F0
Action	(00)1 0	1 0	1 0	0 0	0 0	2A0

In the above example, the lockMask is 11 1111 0000 (hexadecimal 3F0). This means that you can only write action bits to the Kill, Access and EPC memory locations. The lockAction fields are 10 1010 0000 (hexadecimal 2A0) which results in the following:

- Kill Password:
Can be read and write-accessed from the secured state but not from the open state. The Access Password of the tag must be known before the kill password can be read or changed.
- EPC Memory Bank:
Can be write-accessed from the secured state but not from the open state. The Access Password must be known before a new ID can be written to the tag.

For detailed information about the epcGen2LockAction and epcGen2LockMask, see the EPC Radio Frequency Identity Protocols Standard Specification.

Limitations

This function is only valid when the protocol type is set to EPCC1GEN2. Invoking this function while another protocol is set, e.g.ISO18000-6B, will result in an exception.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.21 LockIsoTag

```
LockIsoTag(tagID : string,  
           iso6BAddress : uint,  
           iso6BTagDataLength : uint) : void
```

Parameters

- tagID
The ID of a tag which is to be locked, given as a plain hexadecimal encoded string.
- iso6BAddress
The ISO address is an offset at which to start the locking procedure. The ISO Standard 18000-6 specification defines this address as 1 byte in the range of 0 to 255.
- iso6BTagDataLength
The length in bytes of the ISO tag memory block that is to be locked.

Return value(s)

None.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

Locks an ISO tag against further write-accesses.

For detailed information about the iso6BTagAddress and iso6BTagDataLength, see the ISO Standard 18000-6 (see references section).

Limitations

This function is only valid when the protocol type is set to ISO18000-6B. Invoking this function while another protocol is set (e.g. EPCC1GEN2) will result in an exception.

Version information

Supported in RFID Reader Interface: since V1.0

3.4.22 SetTrigger

```
SetTrigger(triggerType : RfTriggerType,
           triggerState : RfTriggerState) : void
```

Parameters

- **TriggerType**
This is the selected trigger to be changed which is one of the following enumeration values and is normally associated to a hardware key on your device.

Trigger	Description
ScanLeft	Specifies the trigger associated with the left button on the device
ScanRight	Specifies the trigger associated with the right button on the device
ScanTop	Specifies the trigger associated with the button on top of the device (directly above the cursor keys)
ButtonScan	Specifies the trigger associated with a button within the GUI application
PistolGrip	Specifies the trigger associated with the pistol grip button on the device
Application	Specifies a virtual trigger that is only available within the software (configured with RF-MANAGER)

- **triggerState**
This parameter sets the level (state) of a trigger.

Return value(s)

None.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

This function allows setting or resetting a trigger value which in turn triggers execution of code within the reader service (e.g. triggering an RFID source to read tags).

Being able to set the state of a trigger to ON or OFF allows arbitrary behavior of the different keys depending on their configuration. A key may work only as long as it is pressed or as an on/off switch.

Limitations

RF-MANAGER mode only.

Successfully activating a trigger depends on a valid configuration being available. Such a configuration is normally set by a connected RF-MANAGER. If no valid trigger configuration for a given trigger type exists, an error is returned.

Version information

Supported in RFID Reader Interface: since V1.1

3.4.23 SubscribeForNotifications

```
SubscribeForNotifications(notificationChannel : string,
    isFilter : bool) : bool
```

Parameters

- notificationChannel**
 The name of a notification channel that provides tag event data whereas a notification channel is – from the API's perspective – the source of tag events. The following table contains the constants for default notification channel names that are available.

RfReaderApi.NC_RFID	This is the data source name if you want to target the RFID component
RfReaderApi.NC_BARCODE	This is the data source name if you want to target the barcode component
RfReaderApi.NC_ALL	This is a generic name that subscribes for all configured data sources within a project.

- isFilter**
 Determine whether a subscriber is merely monitoring data (i.e. isFilter is false) or intercepts data before it is passed on to other clients.

Return value(s)

A boolean value telling whether the subscription succeeded (true) or failed (false).

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

This function registers for asynchronous notifications of tag events. Users have to either specify the name of the notification channel that creates tag events (which depends on the underlying configuration) or use an empty string or "ALL" in order to subscribe to both the RFID and the barcode notification channel that are available in a default RF-MANAGER project for an handheld device.

Notifications from the underlying reader service are delivered via the TagEventNotifications event.

Limitations

RF-MANAGER mode only.

If there is no configuration data available or the contained notification channels do not match in name, calls to SubscribeForNotifications will fail.

Version information

Supported in RFID Reader Interface: since V1.1

3.4.24 UnsubscribeForNotifications

UnsubscribeForNotifications(notificationChannel : string) : void

Parameters

- notificationChannel
The name of a notification channel that provides tag event data whereas a notification channel is – from the API’s perspective – the source of tag events.
The following table contains the constants for default notification channel names that are available.

RfReaderApi.NC_RFID	This is the data source name if you want to target the RFID component
RfReaderApi.NC_BARCODE	This is the data source name if you want to target the barcode component
RfReaderApi.NC_ALL	This is a generic name that subscribes for all configured data sources within a project.

Return value(s)

None.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

This function stops notifications about tag events via the TagEventNotification event of the reader interface. The given notification channel name specifies which notification to terminate. An empty string or "ALL" unsubscribes from both the RFID and the barcode channel available in a default RF-MANAGER project for an handheld device.

Whenever a previous subscription for a given channel name succeeded, UnsubscribeForNotifications for the same channel name will succeed even if the underlying connection might be temporarily unavailable.

Limitations

RF-MANAGER mode only.

Whenever channel names are used that do not exist within the configuration, UnsubscribeForNotifications will fail.

Version information

Supported in RFID Reader Interface: since V1.1

3.4.25 SetTagEvents

```
SetTagEvents(tagEventTarget : string,
             tagEvents : RfTagEvent[]) : void
```

Parameters

- **tagEventTarget**
The name of the component that created the tag events (i.e. the data's source). The following table contains the constants for default event target names.

RfReaderApi.NC_RFID	This is the data source name if you want to target the RFID component
RfReaderApi.NC_BARCODE	This is the data source name if you want to target the barcode component
RfReaderApi.NC_ALL	This is a generic name that subscribes for all configured data sources within a project.

- **tagEvents**
A list of all tag events that are to be created.

Return value(s)

None.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

This function forwards a list of tag events to the underlying reader service. The function will only succeed if clients previously subscribed as a filtering client (isFilter = true). Unless filtering is active the function will not accept any tag events.

The system is designed in such a way that the list of tag events received via the TagEventNotifications event can safely be used as an input to SetTagEvents without any changes.

Limitations

RF-MANAGER mode only.

Each tag event must specify a valid notification channel name which it targets. Invalid notification channel names will cause the function to fail.

Version information

Supported in RFID Reader Interface: since V1.1

3.4.26 SubscribeForAlarms

```
SubscribeForAlarms(alarmChannel : string,
                   isFilter : bool) : bool
```

Parameters

- **alarmChannel**
The name of an alarm channel that asynchronously provides alarms.

RfReaderApi.AC_ALL	This is a shortcut for all possible alarm channels. The current version of the API does only support the default alarm channel
RfReaderApi.AC_DEFAULT	This is the name of the default alarm channel available in every configuration.

- **isFilter**
Reserved for future use. Must be false in this version of the API. A value of true leads to a not implemented exception.

Return value(s)

A boolean value telling whether the subscription succeeded (true) or failed (false).

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	---

Note

This function registers for asynchronous notifications of RFID alarms. Users have to either specify the name of the alarm channel (which depends on the underlying configuration) or use an empty string or "ALL" in order to subscribe to all available alarm channels.

Notifications from the underlying reader service are delivered via the Alarms event.

Users should always subscribe for alarms both when working RF-MANAGER integrated or standalone. The ReaderService uses the alarm channel to notify clients about the end of its startup or restart phase by sending a "Reconfiguration" alarm. Only after receiving this alarm, the RFID interface is fully initialized and able to support all features.

Limitations

RF-MANAGER mode only.

If there is no configuration data available or the contained alarm channels do not match in name, calls to SubscribeForAlarms will fail.

Version information

Supported in RFID Reader Interface: since V1.1

3.4.27 UnsubscribeForAlarms

```
UnsubscribeForAlarms(alarmChannel : string) : void
```

Parameters

- alarmChannel
The name of an alarms channel that you want to unsubscribe

Return value(s)

None.

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

This function unregisters for asynchronous notifications of RFID alarms. Users have to either specify the name of the alarm channel (which depends on the underlying configuration) or use an empty string or "ALL" in order to subscribe to all available alarm.

Limitations

RF-MANAGER mode only.

If there is no configuration data available or the contained alarm channels do not match in name, calls to UnsubscribeForAlarms will fail.

Version information

Supported in RFID Reader Interface: since V1.1

3.4.28 GetConfigParameter

`GetConfigParameter(parameterName : string) : RfInfoItem`

Parameters

- `parameterName`
The name of the configuration parameter whose value should be retrieved

Return value(s)

The value for the configuration parameter in an `RfInfoItem` structure.

Exceptions

<code>RfReaderApiException</code>	Error while communicating with the reader service. Check the <code>Error</code> member for more information.
-----------------------------------	---

Note

This function retrieves information about a given configuration parameter.

The `RfInfoItem` structure contains both the name and the value for a parameter. Moreover, it provides information to which feature set the configuration parameter applies. Each parameter might apply to either RFID, barcode or global configuration. A parameter can apply to both RFID and barcode as well.

If a parameter with a given name is not available, null is returned. For known parameters their current value is returned. Following is a list of the currently available parameters.

Some configuration parameters are for your information only. They do not prevent you from using a special feature but give information on how a client or user interface should behave to comply with what has been configured in RF-MANAGER. Those parameters are flagged with `Info` in the last column of the table below.

Other configuration parameters have an effect on how certain functions behave or whether a feature can be activated or not. Mostly this applies to the trigger configuration.

Configuration Parameter Name	Possible Values / Description	Info vs. Config
MobileOperatingMode Enabled	This parameter tells you if the device is working in remote mode (FALSE) or mobile mode (TRUE). Whenever this parameter is false, you may only monitor tag events. Only if this parameter is true, filtering is enabled and tag events might be changed and can be fed in again with the SetTagEvents API function.	Info
EditTagEnable	This parameter could be used by your applications. It signals that changing of tags is allowed inside your application.	Info
ScanBeepEnable	Produce a sound on valid reads (if true).	Info
ScanResultTime	The configured scan time	Info
<p>All of the following configuration parameters give information on how certain triggers are configured. On the one hand they specify whether a configured trigger is only valid as long as the associated key is pressed (KEY_PRESSED) or whether the trigger implements an ON/OFF toggling (START_STOP). This information is for information only.</p> <p>Moreover, depending on the configuration, each trigger is associated with either RFID scanning or barcode scanning or with both. This defines which function will be triggered and is thus relevant for your client.</p>		
PistolGrip	Information about the pistol grip button	Config
Scan Key Left	Information about the scan key button on the left of the device	Config
Scan Key Right	Information about the scan key button on the right of the device	Config
Scan Key Top	Information about the scan key button on top of the device	Config
Application	Information about the virtual software trigger	Config

Limitations

RF-MANAGER mode only.

There has to be valid RF-MANAGER configuration data available in order to successfully retrieve values.

Version information

Supported in RFID Reader Interface: since V1.1

3.4.29 TagEventNotification

TagEventNotifications

Event

RfNotificationHandler(sender : object, args : RfNotificationArgs)

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

This event provides notifications about tag events that the underlying reader service produced.

Both RFID and barcode events will be delivered depending on the configured data sources.

As a prerequisite clients have to subscribe for tag events. As long as no subscription occurred, the TagEventNotifications event will not provide any data.

Whenever tag event data is available, the notification arguments will contain an array of RfTagEvent objects.

Each RfTagEvent object provides information about the tag id, the tag type (i.e. barcode or RFID), the event type (e.g. glimpsed or observed), the time an event occurred as well as information about the source of the data, the notification channel which sends the events and the trigger which led to the event.

When working in filtering mode, the RfTagEvent list can be passed on to the SetTagEvents function.

Each tag event contains a bunch of members giving information about the event itself and about the reader and environment that created the event.

Whenever existing events are modified or own events are created some of these members are required to have reasonable values. Those are marked with "mandatory" in the last column of the table below.

Take special care in providing correct event times and types as well as tag type, source and notification names because these values are heavily used in ordering, sorting and filtering events.

RfTagEvent Member	Possible Values / Description	Mandatory
TagID	The read tag ID as a hexadecimal encoded string.	x
TagType	The tags type (EPC or barcode)	x
EventType	The event type (GLIMPSED, OBSERVED, LOST, UNKNOWN, NEW)	x
EventAntenna	The antenna number that sent when reading the tag	
EventTimeUTC	The time when the event occurred in UTC format	x
EventTimeTick	The time when the event occurred in time ticks (must correspond with EventTimeUTC)	x
EventTrigger	The name of the trigger which caused the event	
SourceName	The name of the data source at which the tag event was created	x
NotifyTriggerName	The notification channel trigger that caused the event to be sent.	
NotifyChannelName	The name of the notification channel which sends the event	x
ReaderNowUTC	The reader's current time in UTC format	
ReaderNowTick	The reader's current time in time ticks	
ReaderName	The name of the reader	
ReaderHandle	An internal handle value of the reader	
ReaderEPC	The reader's EPC identifier	
NotificationID	A unique ID per tag event	x

Limitations

RF-MANAGER mode only.

There has to be valid RF-MANAGER configuration data available in order to successfully retrieve values.

Version information

Supported in RFID Reader Interface: since V1.1

3.4.30 Alarms

Alarms

Event

RfAlarmHandler(sender : object, args : RfAlarmArgs)

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

This event provides notifications about alarms whereas an alarm is considered not only as a warning or error condition but also as a means of notification about changed system states.

Contrary to the TagEventNotifications event the Alarms event provides information even without an explicit subscription (i.e. a call to SubscribeForAlarms in this case).

In order to distinguish errors from notifications the RfAlarmArgs may contain either an array of RfAlarm objects or an array of RfInfoltem objects. Following is a list of the public members of the alarm arguments.

Member	Type	Description
Alarms	RfAlarm[]	Whenever a system error or warning is issued, it is contained in one or more RfAlarm structures in this member. If the alarm is a notification only this member is null.
Infoltems	RfInfoltem[]	This member contains information about configuration changes or the current system state packed in RfInfoltem structures. If the alarm signals an error or warning, this member is null.
AlarmMessage	string	If an alarm occurs that does not apply to one of the two options above, it is delivered as a simple string in this member. The default value is null.
IsDataBuffering	bool	This member is a shortcut for a configuration notification that signal the begin or end of local data buffering with true. In all other cases this member is false.
IsConfigStart	bool	This member is a shortcut for a configuration notification that signal the begin of a reconfiguration due to new configuration data received from a connected RF_MANAGER. In all other cases this member is false.
IsScanning	bool	This member is a shortcut for a configuration notification that signals the begin or end of a current progressing scan with true. In all other cases this member is false.

Version Information

Supported in RFID Reader Interface: since V1.1

3.4.31 Information

Information

Event

InformationHandler(sender : object, args : InformationArgs)

Exceptions

RfReaderApiException	Error while communicating with the reader service. Check the Error member for more information.
----------------------	--

Note

Provides categorized information about internal actions and status changes.
The arguments InformationArgs consist of:

- Type : InformationType
Categorizes the information given. Valid categories are: Debug, Info, Notice, Warning, Error, Critical, Alert, Emergency
- Message : string
The message to be delivered.

Version information

Supported in RFID Reader Interface: since V1.0

3.5 References

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