

Canon

imageWARE
Remote

Technology/Security Whitepaper

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IMPORTANT NOTICE

This document was created based on the latest technical information available as of April 2006. This information is subject to change without notice.

CONTENT:

1. Overview

- About this Whitepaper
- About imageWARE Remote
- Supported Devices

2. Embedded RDS Overview

- What is eRDS?
- Architecture

3. Network Security

- LAN
- Communication between UGW Server and eRDS Devices
- Authentication Procedures

4. General Considerations

- Customer Requirements
- Image Data
- Failures
- Data Storage Time

1. Overview

About this Whitepaper This document is intended for IT administrators who would like to study the security features, system architecture and network impact of Canon U.S.A.'s imageWARE Remote services.

This document is NOT confidential.

About imageWARE Remote Canon imageWARE Remote is a service that Canon is making available to our dealers and service providers, enabling them to provide better service to their customers.

imageWARE Remote consists of two components: imageWARE Remote Meter Reading (collects meter reads automatically from enabled imageRUNNER devices) and imageWARE Remote Service Monitor (provides information about device status, error notifications and statistics about parts lifetime and consumables). Both services use the same underlying technology (**embedded Remote Diagnostic System - eRDS**) to capture device information and transmit such information to a Canon server via the Internet, where it is accessible by the service provider via a web interface (**Universal Gateway, UGW**).

Once activated, eRDS will submit both meter readings and service information to the UGW. However, depending on the business model selected by the Dealer/Service Provider, the UGW will allow for access of meter reading only (imageWARE Remote Meter Reading) or both meter reading and service information will be made available (imageWARE Remote Service Monitor).

Supported Devices Currently all Canon imageRUNNER 70 Series devices are supported. The embedded RDS technology is already available on these devices and needs to be activated in service mode to start working. At the time of imageWARE Remote launch, Canon imageRUNNER 30 Series devices will only support embedded RDS if they are equipped with a Canon Multi-PDL printer board.

Supported models at time of launch:

All 70 Series imageRUNNERS including color-enabled imageRUNNERS
iR105+, iR7105, iR7095, iR7086
iR2230/2830/3530 with optional Printer Kit E2 or Printer Kit E3

Supported models may change in the future. Please refer to Canon's eSupport website or contact your Canon representative directly to obtain the most current information regarding imageWARE Remote.

2. Embedded RDS Overview

What is eRDS? Canon's imageRUNNER series devices ship equipped with embedded Remote Diagnostic System (eRDS) capability.

eRDS is a technology that allows the imageRUNNER devices to connect directly to a Universal Gateway Server (UGW) for the purpose of collecting counter, jam, error, and alarm data in order to improve the level of customer support and service that Canon service providers can offer to their customers. eRDS provides the following benefits:

Automatic Meter Reading

eRDS captures and provides meter data automatically via the network to the UGW, reducing the need for manual collection of meter readings by the customer and reporting them to the dealer for billing purpose.

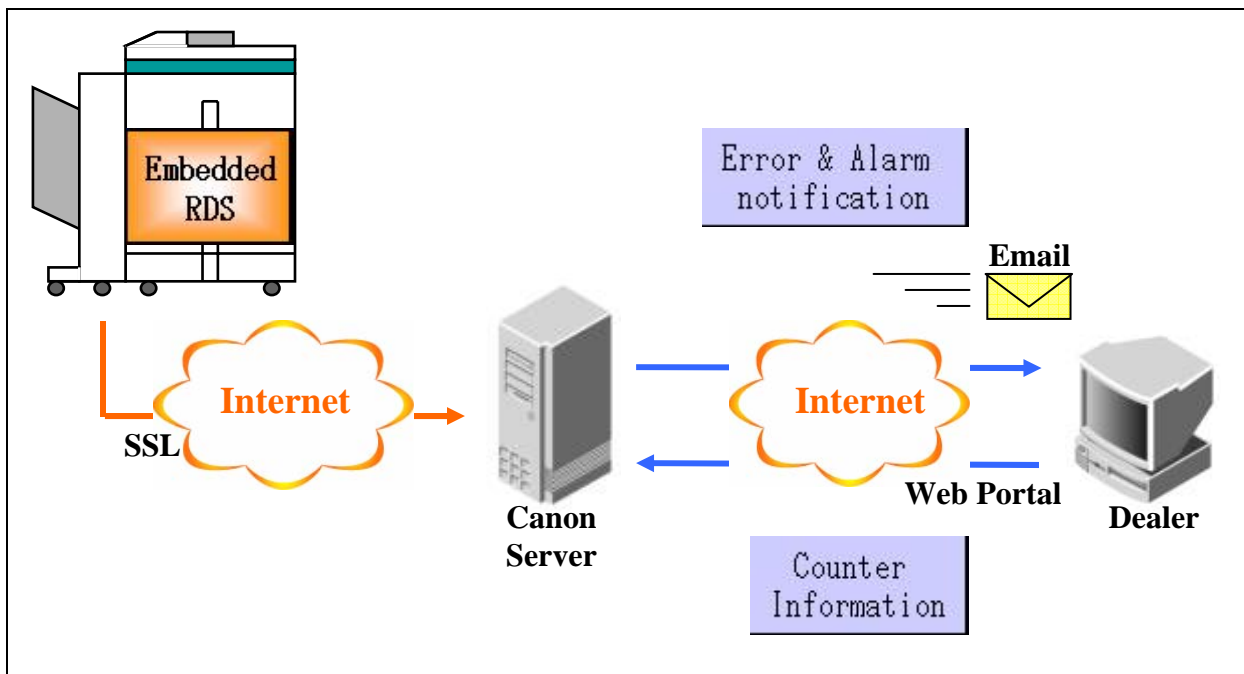
Enhanced Service Offering

Automatic Error, Jam, and Alarm Notification can be used to improve dealer's response time.

Usage Statistics, Parts Lifetime and Consumables Management

As part of the imageWARE Remote Service Monitor feature, service providers have access to information on parts usage of their customers' registered imageRUNNER devices. This can be used to offer pre-emptive service to the customer, before consumable and durable parts reach the end of their expected life cycle. In addition, information about toner usage allows the service provider to make suggestions about re-ordering or stock quantities.

Architecture



This simplified figure shows the architecture of the eRDS system.

Meter readings are available on the UGW server for download by the service provider (pull process).

Error/Jam/Alarm notifications can be sent directly to the service provider by e-mail upon occurrence (push process).

3. Network Security

LAN Communication Target and Protocol

The eRDS communicates only with the UGW and will never communicate with other devices that are connected to a customer's Local Area Network.

Communication between UGW Server and eRDS Devices

Communication Target

The eRDS enabled imageRUNNER communicates only with the UGW when sending device information. The authentication method is described later.

Communication Protocol

The eRDS enabled imageRUNNER communicates with the UGW by using the HTTPS protocol. The eRDS enabled imageRUNNER acts as the "Client", and will never become a HTTP server for the purposes of eRDS communication. Please note that some imageRUNNERS may act as an HTTP server for other non-eRDS related features such as MEAP and Remote UI.

Data to be collected and forwarded

The data to be collected by eRDS and forwarded to Canon's Central Server is shown in Table 1. The eRDS enabled imageRUNNER sends the data shown in Table 1 to the UGW at specific intervals.

Table 1

Item	Description	Data size
Billing Meter Information	The counter information to be used for billing.	62 kb
Detail Meter Information	Contains the counter information of "Total", "B/W" and "Color" per paper size, etc. Varies by model.	153 kb
Error Information	Includes "Error Code", "Error sub code", "Occur date", "Total Counter", "Paper Feed", "Paper Size"	4 kb
Paper Jam Information	Contains "Jam code", "Occur Date", "Total Counter", "Paper Feed", "Paper Size", etc..	4 kb
Alarm Information	Includes "Alarm Level", "Alarm Code", "Alarm Sub Code", and "Occur Date", "Total Counter".	4 kb
Status Information	The status change information.	3 kb
ROM Version Information	Contains the ROM version of "Main", "Scan", "Print", "Feeder", "Finisher", "Fax", "PDL", and "Tray".	4 kb
Parts Counter Information	The counter information of each part. The 'Number of Sheets' for each part	33 kb

	will always be forwarded as well as either 'Time' or 'Number of Counts'. The number of parts varies according to the model.	
Debug Log Information	The log information for debugging which an application creates when trouble occurs.	13.5 kb

Timing of transmission and network traffic

Table 2 below shows that in the case of the "Regular Transmission", the maximum size of the transmitted data packages is about 250 kb. Moreover, the frequency of regular transmission is only once every 16 hours, resulting in only minimal increase in network traffic on the customer's LAN.

Table 2

Category	Timing of transmission	Transmitting data	Data size
Error	When an error happens	Error information	4 kb
Paper Jam	When a paper jam happens	Paper jam information	4 kb
Alarm	When an alarm occurs	Alarm Information	4 kb
Status change	When a status changes	Status change information	4 kb
Regular transmission	Transmission once every 16 hours. The UGW specifies the transmission time based on the return value of the communication test.	- Billing meter information - Detail meter information - Parts counter information	250 kb
ROM Version	Transmission once every 7 days. The UGW specifies the transmission time based on the return value of the communication test.	-ROM version Information	4 kb
Debug log	When a debug log reaches a regulated value.	Debug log information	13.5 kb

**Authentication
Procedures****Server Authentication**

The UGW uses SSL Authentication together with application authentication. The eRDS function never transmits information to servers other than the UGW using these methods.

1) SSL Authentication

SSL Authentication is performed according to the following procedures. Please note the following steps describe the SSL protocol and are not specific to Canon's eRDS technology.

- "Root Certificates" published by Verisign are installed in an imageRUNNER when it ships from the factory.
- When the eRDS enabled imageRUNNER starts communicating, it receives the "Server Certificate" published by Verisign from the UGW by HTTP.
- The eRDS device compares the "Server Certificates" with the "Root Certificates".
- If these certificates match, the eRDS device successfully authenticates that the other communicating party is the UGW.
- The HTTPS communication begins after the negotiation of the encryption method using HTTP.

2) Application level authentication

Application-level authentication further secures the eRDS communication between the imageRUNNER and the UGW.

The URL of the UGW Server is pre-populated into the firmware of the imageRUNNER.

Service personnel can change this URL. However, the firmware will only attempt a transmission if the domain name of the URL is in the UGW's DNS domain.

In case a user changes the URL to something outside of the UGW DNS domain, the imageRUNNER will not transmit any data.

Client Authentication

This section describes the client authentication used by the UGW.

1) Client authentication by SSL (OSI Layer 4 to 5)

Client authentication by SSL is not performed.

2) Client authentication by application (OSI Layer 7)

The UGW will receive information only from devices whose serial numbers

have been registered on the UGW by the dealer. Prior to registration on the Universal Gateway, a communication test needs to be performed on the imageRUNNER, establishing communication between the UGW and the device.

Reverse engineering is impossible because of SSL encryption and the use of the Canon proprietary SOAP schema (communication protocol). Therefore, a rogue client cannot be developed.

4. General Considerations

Customer Requirements

Network Connection

In order for the eRDS to work effectively, a continuous network connection is necessary. If network connection is lost temporarily or permanently, the functions of imageWARE Remote (Meter Reading and Service Monitor) will not be available, resulting in a delayed reporting of meter reads or, in the case of service notifications, these will not be transmitted in a timely manner, jeopardizing the benefits of the Service Monitor feature.

Network Traffic

Although the data packages sent from the eRDS enabled imageRUNNER are very small, IT administrators will most likely note increased network traffic due to the communications between the imageRUNNER and the UGW.

In addition, the hard coded URL of the UGW may become the most frequently addressed URL within the organization. This is due to the scheduled and event-related communications between the imageRUNNER and the Canon server. To ensure uninterrupted performance of the imageWARE Remote services, it is important that this URL remains unchanged and will not be blocked.

Power

Power outages or device shutdowns by employees will result in an interruption of data transmission. No meter reading information can be transmitted to the UGW. Upon return of power, the imageRUNNER device will start communicating with the server again.

Image Data

The types of data collected and submitted by the eRDS function on the imageRUNNER is described in “Network Security”, table 1. Besides transmission of the described data, the eRDS is not capable of sending or receiving image data.

Failures

After network failures or power outages, the imageRUNNER device will automatically start communicating with the Canon server once the situation is corrected. Execution of another “communication test” is not required.

Data Storage Time

Meter data will be stored in the Universal Gateway database for 12 months, however; only the most recent meter data is accessible for download from the Web Portal by the service provider.

Service information/statistics will also be stored for 12 months. Storage time may be changed in the future.