



DxONE PRO*Service* REMOTE SERVICE APPLICATION

Remote Management System (RMS) technology,
architecture and security information for
IT professionals



MORE WAYS TO INCREASE UPTIME AND IMPROVE PRODUCTIVITY

GENERAL INFORMATION

Medical diagnostics are a vital part of the modern healthcare system, and instrument uptime is critical to diagnostics throughput and profitability.

Improved instrument uptime can be attained by:

- › Reducing unscheduled service through remote and proactive monitoring of instrument trends
- › Ensuring that the field service engineer has the right parts for on-site visits
- › Making service visits more efficient through knowledge of mass trends across the installed base
- › Resolving instrument issues remotely

These are all worthwhile goals, and Beckman Coulter can support your organization's need for secure, efficient instrument management through DxONE PROService.

DxONE PROService: Enhancing instrument performance

DxONE PROService features [*]	Benefits
Remote Troubleshooting	<ul style="list-style-type: none"> › Maximize uptime with online support through Remote Desktop Sharing (RDS) › Easily update Help files by remote upload › Expedite troubleshooting by upload of instrument datafiles to Beckman Coulter Regional Private Cloud › Enable remote Beckman Coulter service to visualize instrument status for proactive support
Proactive and Predictive Triggers (Alerts)	<ul style="list-style-type: none"> › Identify and resolve issues before they affect instrument performance › Maximize uptime by avoiding or reducing unscheduled downtime › Reduce service calls initiated by you
Remote Instrument Setup/ Configuration	<ul style="list-style-type: none"> › Shorten on-site visit time for instrument/middleware setup › Expand test menu remotely eliminating on-site visits › Upload assay configuration and settings

^{*} DxONE PROService availability or features vary by instrument/system platform.

DxONE PROService design highlights

DxONE PROService utilizes RMS—a secure, proprietary data pipeline—to connect Beckman Coulter instruments in customer laboratories with Beckman Coulter's service and support department. This encrypted interface can connect multiple instruments simultaneously with little impact to customers' IT systems.

- › The RMS Remote Application Processor (RAP) box connects to the instrument Transmission Control Protocol/Internet Protocol (TCP/IP) port and creates a firewalled subnet for the connected instruments
- › Instrument status is sent via Hypertext Transfer Protocol Secure (HTTPS)/Transport Layer Security (TLS) to DxONE PROService

Architecture

The DxONE PROService application uses the RMS RAP box, the Internet and sophisticated enterprise software to connect your Beckman Coulter instruments to support staff.



RMS Remote Application Processor (RAP) Box

At the client

The RMS RAP box is a dedicated communications processor that buffers and forwards status reports from software agents on each instrument to Beckman Coulter servers. It also provides authentication and VPN services to support remote instrument management.

En route

All data is encrypted with 128-bit Advanced Encryption Standard (AES) with SHA-2 hashing and sent over the Internet via TLS.

DxONE PROService uses the popular open source TLS VPN called OpenVPN. OpenVPN utilizes OpenTLS cryptographic modules for data encryption, which is used for RDS.

At Beckman Coulter

Beckman Coulter's dedicated database and servers handle data collection and analysis. The new platform enables Regional Private Cloud enabling flexibility, accessibility and high performance. Country-specific compliance and data security is easily achievable resulting in better quality healthcare. The system (Figure 1) supports sophisticated reporting and triggers, which alert Beckman Coulter service and support staff to potential instrument issues. Access to instrument data and status is controlled according to the training, role and location of the Beckman Coulter staff.

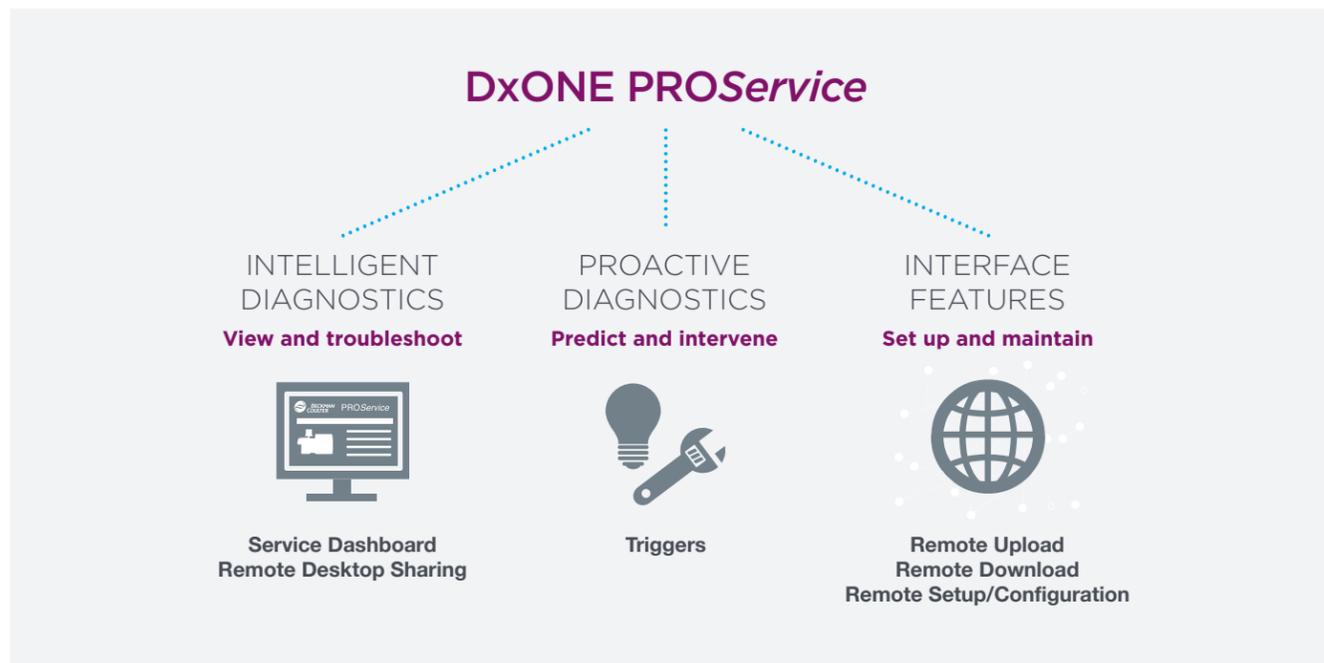
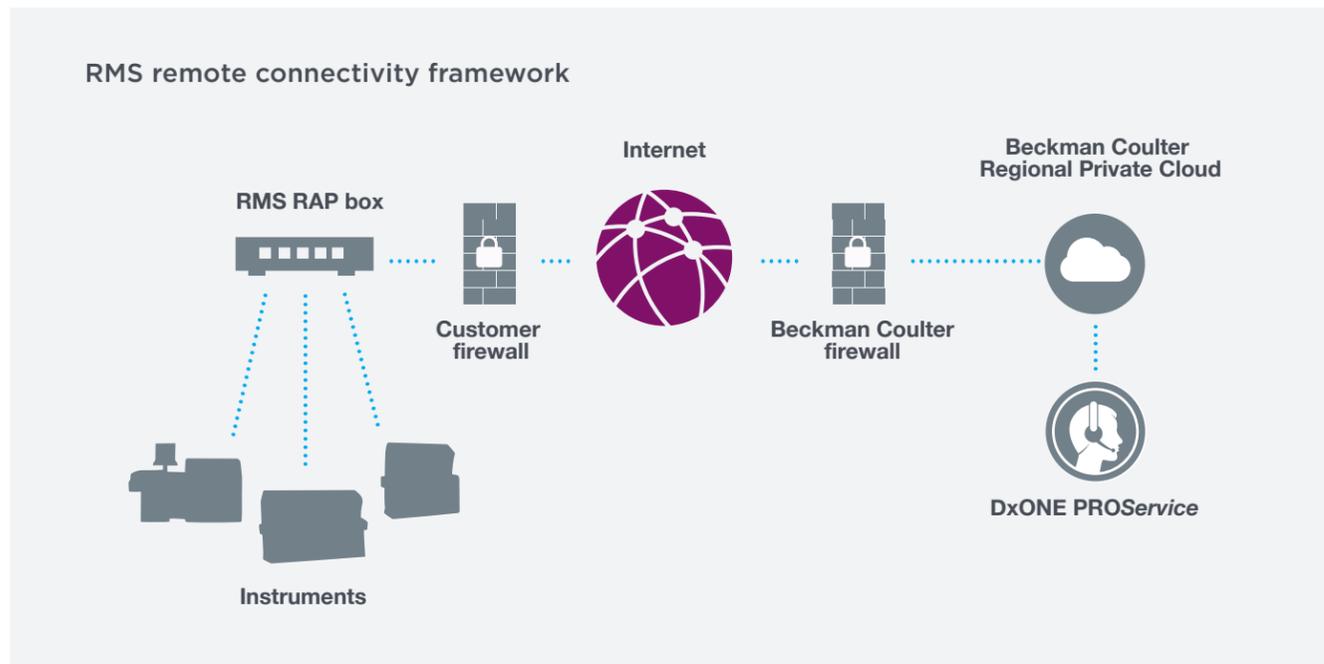


Figure 1. Standard RMS connection

HARDWARE

The RMS RAP box is a small, custom computer running Red Hat Enterprise Linux (RHEL). For reliability, it has a solid-state drive (SSD), fanless cooling and no moving parts. It has Ethernet ports for each connected instrument plus one for the network/Internet connection. Beckman Coulter performs all RMS RAP box software updates and maintenance, most of which is done remotely.

SOFTWARE

The RMS RAP box includes a custom software stack running RHEL with appropriate updates. It uses OpenTLS for data in transit and a Federal Information Processing Standards (FIPS) 140-2 validated protocol.

The DxONE PROService enterprise software gathers and analyzes inputs from all connected instruments and performs lookups and comparisons to provide instrument status and health dashboards for the DxONE PROService support team. Instrument performance is compared against the body of evidence to raise alerts to the Beckman Coulter service and support staff for timely action.

SECURITY

Appropriate configuration standards are applied to achieve and ensure data security-specific areas include operating system configuration and security enhancements, web server security enhancements and message-processing security.

RMS RAP box operating system security features

Security Technical Implementation Guides (STIGs)¹ are applied for RHEL version 5 and desktop, including the following actions:

- > Update all installed RHEL version 5 software Common Vulnerabilities and Exposures (CVE)
- > Enhance physical access security
- > Disable unnecessary user accounts and software
- > Limit access to RMS RAP box files
- > Disable interactive, unencrypted communication to RMS RAP Box
- > Enable remote audit logging
- > Enable FIPS 140-2 approved ciphers for remote shell
- > Enable basic input/output system (BIOS) authentication
- > Close unused ports securely

RMS RAP box web server security features

Applied STIGs for web servers include the following actions:

- > Enable TLS to local web server
- > Disable unnecessary Apache modules from loading
- > Enable complete web server logging
- > Restrict access to served pages
- > Disable all Common Gateway Interface scripts

RMS RAP box message processing security

The Application Security and Development (ASD) STIG² is applied, which includes the following:

- > Enable FIPS 140-2 approved algorithm for data encryption using Java SunPKCS11 provider in FIPS mode
- > Collect audit logs and update to remote server



COMMUNICATIONS

There are two main forms of communication: regular status messaging and remote management sessions. Other benefits are below.

- › Regular status messages are sent from the RMS RAP box using HTTPS POST
- › Remote management uses VPN sessions
- › The system uses minimal bandwidth for messaging and only needs 128 kbps for a remote management session
- › Communications are encrypted and only established between known, authorized addresses
- › Remote service must be authorized by a user at the instrument in order to be addressed. A secure VPN tunnel is established only for the duration of that session
- › The RMS RAP box's firewall rejects external communication requests
- › The system can accommodate HTTP and Socket Secure (SOCKS) proxy servers. It requires Internet access with port 443 available, except in IPSEC VPN connections

Communications security

Security features include two-way TLS authentication to secure all communication between your Beckman Coulter instruments and the Beckman Coulter data center.

Beckman Coulter leverages third-party certification authority to issue digital TLS certificates for verification of RMS RAP box identity.

The software encryption modules are National Institute of Standards and Technology-compliant, ensuring they are securely developed and maintained throughout the system's life cycle.³

VPN uses OpenVPN with OpenTLS in FIPS mode as well as two-way TLS authentication.

Memorandum of Understanding and Interconnection Security Agreement (MOU/ISA)

Beckman Coulter also completed the MOU/ISA with the U.S. Department of Veterans Affairs (VA) to connect and utilize all DxONE PROService features at all VA sites.



SUMMARY

DxONE PROService enables the secure transmission of instrument status information to Beckman Coulter so you can focus on patient care.

- › Conforms to Information Security standards established by the industry and VA
- › Reduces unscheduled downtime by enabling proactive, preventive action to be taken by you or Beckman Coulter
- › Minimizes interruptions when service is needed by expediting issue isolation and readiness of parts

Glossary

Term	Definition
ASD STIG	The Application Security and Development Security Technical Implementation Guide: a series of application security requirements that apply to "all DoD developed, architected, and administered applications and systems connected to DoD networks" ⁴
DoD	U.S. Department of Defense
FIPS	Federal Information Processing Standards: publicly announced standardizations developed by the U.S. federal government for use in computer systems by all non-military government agencies and by government contractors, when properly invoked and tailored on a contract; ensures that all federal government agencies adhere to the same guidelines regarding security and communication
FIPS 140-2	A U.S. government computer security standard that specifies the minimum cryptographic modules requirement for data encryption and is validated by the National Institute of Standards and Technology
IA	Information Assurance: DoD Information Assurance actions that protect and defend information systems by ensuring availability, integrity, authentication, confidentiality and nonrepudiation
MOU/ISA	Memorandum of Understanding (MOU) and Interconnection Security Agreement (ISA) memorializes the agreement between the VA and Beckman Coulter regarding the management, operation and security of a connection between the Beckman Coulter RMS RAP box connected to laboratory instruments, owned by the VA, and DxONE PROService, owned by Beckman Coulter
RAP box	The hardware (i.e., a small, headless computer) responsible for facilitating the communication between connected Beckman Coulter instruments and the Beckman Coulter data center via its trusted subnet; responsible for deciding when to use local storage, dispatching and executing local commands, and controlling the VPN tunnel, including starting and authentication
TLS	Transport Layer Security: a session layer security protocol used on the Internet to secure web pages and transactions by means of public key cryptography
Triggers	A set of conditions that, when matched to instrument data, alerts the DxONE PROService support team
VA	U.S. Department of Veterans Affairs

References

1. STIGs used to validate the DxONE PROService RMS RAP box system (iase.disa.mil/stigs/a-z.html):
 - › Red Hat Enterprise Linux 5
 - › Apache Server for Unix
 - › Network Policy
 - › Desktop Applications General
 - › Application Security and Development
 - › Apache Site for Unix
 - › Anti-malware
2. Department of Defense. (2014) Application Security and Development Security Technical Implementation Guide, Version 3, Release 6, January 24, 2014. Retrieved from http://iase.disa.mil/stigs/app_security/app_sec/app_sec.html
3. NIST (2014). Validated FIPS 140-1 and FIPS 140-2 Cryptographic Modules. Retrieved from <http://csrc.nist.gov/groups/STM/cmvp/documents/140-1/140val-all.htm> (1320 and 1384 Cryptographic Modules)
4. NIST (2014). FIPS PUB 140-2 - Effective 15-Nov-2001: Security Requirements for Cryptographic Modules. Retrieved from <http://csrc.nist.gov/groups/STM/cmvp/standards.html>

DxONE PROService availability or features vary by instrument/system platform.

MOU/ISA memorializes the agreement between VA and Beckman Coulter regarding the management, operation, and security of a connection between the Beckman Coulter RAP box connected to laboratory instruments, owned by VA, and DxONE PROService, owned by Beckman Coulter.

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