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**Executive Summary**

Easy to use, reliable communications and networking systems are mission critical in a wide variety of military, emergency, and commercial environments.

IQ-Core Software enables PacStar and our partners to build systems that are quick to set up, easy to use, reliable, secure, and easily extendible.

This whitepaper provides a capabilities and technical overview of IQ-Core Software.

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Introduction

PacStar IQ-Core® Software is a robust communications management software platform providing:

- An intuitive user interface making set-up and operation by non-technical personnel quick and easy to learn with significantly fewer mis-configuration errors.
- Powerful wizards and alerts with common user interfaces across all hardware and software components automating both complex and routine tasks.
- Interoperability with a broad range of tactical and enterprise communications hardware and systems, enabling easy, consistent operation even with upgrade and replacement of system components.
- An extension of advanced IP-enabled unified communications (voice, video, data sharing, etc.) to the edge without increase in complexity of operation.
- Vendor agnostic remote management with the ability to monitor, change device configurations and troubleshoot from anywhere in the world.

Typical systems composed of commercial off the shelf equipment suffer from a high degree of complexity, requiring operators to undergo extensive training on multiple systems, with different user interfaces. For example, one of PacStar’s products deployed today contains the following native user interfaces provided by the equipment vendors.
These screen shots illustrate a significant problem, that's continuing to get worse, not better. As the complexity of deployed systems continues to rise (with the addition of wireless systems, unified communications technologies, virtualization, and ever-increasing IA requirements) – the difficulty in using the system rises exponentially. Yet, operators are receiving little additional training, and workforces are shrinking.

This dynamic contributes to an ongoing, major problem: system downtime. As shown in the chart on the right from the Gartner Research, human factors are typically implicated as the cause of system downtime 50% to 80% of the time.
IQ-Core Software is designed to combat this trend, with an easy to use UI assisting operators in routine/frequent tasks, and providing a time-saving solution for advanced administrators. In an independent usability study of basic tasks such as adding users and backing up equipment configurations, IQ-Core Software demonstrated this benefit dramatically – completing routine system configuration tasks 4x faster than using manual methods, and reducing configuration errors by 3-6 times.

PacStar provides IQ-Core Software today on numerous PacStar products, and has proven the software in the field with customers such as the US Army WIN-T program, the US DoD Joint Communications Support Element, the US Navy Deployed Joint Command and Control program, and numerous Army, Navy, Air Force, Joint commands, and NATO. IQ-Core Software is Information Assurance (IA) and Certification Ready - it has been included on five JITC-certified systems. The software is in use by numerous civilian emergency responder and local government agencies as well, with thousands of copies deployed with systems today.

IQ-Core Software is available for integration into custom, deployable or fixed enterprise-class solutions. IQ-Core Software is designed with “net-centric” principles that enable rapid customization and support for new networking equipment and applications. PacStar can quickly adapt the user interface to support specific customer requirements.

IQ-Core Software provides the following advantages:

- Technology optimized for the edge – Unlike enterprise network management software packages that prove too complex for all but the most advanced IT personnel to configure and manage, PacStar developed IQ-Core Software which manages products and technology “outside-in,” creating an intuitive user experience.
• A unified view - for network monitoring and diagnostics providing users with real-time snapshot of the health of the network, and ability to provide backup and restorations of entire network.
• Adapts to user level – While IQ-Core Software is designed for non-specialists, it offers the flexibility and capabilities to meet the needs of “power” users. For power users, IQ-Core Software provides command line access and automation from a single solution, enabling them to complete tasks faster.
• Drives down costs - of deploying COTS communications solutions. Reduces the number of comms specialists required to stand up and manage communications equipment, and reduces the training required to operate equipment. Saves cost compared to enterprise network management software pushed down to edge operations.
• Enhances ability to meet mission objectives, reducing setup time and allowing comms to adapt to rapidly changing circumstances. Improves uptime, allowing personnel to focus on fighting the fight, not fighting the network.
• Vendor-agnostic interoperability – Unlike many enterprise software solutions that only integrate with specific product families and lock customers into one product line, IQ-Core Software integrates with a broad range of tactical and enterprise communications hardware and systems, enabling organizations to easily upgrade, replace, or reconfigure deployable systems.

Developed entirely on-shore by PacStar engineers, IQ-Core Software benefits from extensive experience and deployment in the field – containing innovations developed in collaboration with the most demanding communicators. PacStar IQ-Core Software is protected by U.S. Patent #7,535,861.

IQ-Core Software

Enabling soldiers to fight the battle, not the network
**IQ-Core Software Tour**

The following sections outline *examples* of the features available in IQ-Core Software – implemented as dashboard screens and wizards. The wizard approach to tasks provides easy to follow, step-by-step procedures with a common look and feel across tasks.

Depending on customer equipment and customer use-cases, PacStar can tailor the features and wizards to provide optimal solutions – maximizing the benefits of the software. Wizards may also be customized by advanced administrators – disabling steps that are not allowed for operators, and setting defaults to streamline tasks.

**Main Dashboard**

The main dashboard of IQ-Core Software shows green/red status of devices, device summary information, and shows “recent events” in the main event viewer panel. PacStar can easily modify the dashboard for specific customer needs as well.
User Management

One of the most common tasks associated with managing communications systems is called MAC – “Move, Add, Change” of users. IQ-Core Software makes this easy through its user management system and user management wizards shown below.

Operators can easily add/change/delete users in this centralized screen, and IQ-Core Software takes care of managing the underlying systems (such as Active Directory/LDAP, Microsoft Exchange, RADIUS, Cisco Unified Communications Manager) to ensure integrity.

The user list may also be imported and exported enabling operators to move users from system to system, or to backup and restore configuration quickly.
Shown below are several of the available user management wizard screens, illustrating the step-by-step and simple process to add a user – all completed without requiring training on multiple underlying systems.
Phone System Management

Phone management is centralized through the screen below. IQ-Core Software can merge phones from multiple phone systems into a single, integrated list and allows modification of pertinent phone and line settings via wizards. Phone switch port and VLAN information can also be obtained and displayed. Phones can be associated with users for easier tracking.
Add VoIP Phone Wizard

The following screens show examples of adding/configuring VoIP phones for Cisco Unified Communications Manager – including setting switch port security settings, and setting Wizard defaults.

This wizard makes it easy to add a VoIP phone to Cisco UCM.

The Add Phone wizard lets you quickly and easily configure the switch port that the phone is plugged into.

The Add Phone wizard also lets you quickly set up phone numbers for that phone.
Phone System Configuration Summary Views

IQ-Core Software provides summary information on the configuration of call management solutions such as Cisco Unified Communications Manager – enabling operators to see configuration information at a glance.

The Cisco UCM route plan can be quickly viewed without going into the native Cisco interface.
The Cisco CSS vs Partition matrix is a favorite feature of Cisco UCM administrators since it gives a view of the mappings not available elsewhere.
Call Detail Records (CDRs)

IQ-Core Software provides call detail records (CDRs) on request, integrated from one or more phone systems. These views can contain integrated information about Cisco and REDCOM phone calls, both intra-system and inter-system.
Call Management Reports

IQ-Core Software provides call management reports on request, providing extensive information about the usage and performance of Cisco UCM-based IP communications. Reports are customizable for date range and type of information included. Example reports include:

- Call Volume Reports
- Call Quality Reports
  - Jitter, Latency, MOS, etc.
- Call Failures Reports
- Top Callers Reports
- Trunk Statistics
- Reports by Phone
- Complete Call Management Records Report

Example reports follow:
Device Management
Device management is centralized through IQ-Core Software via the screens below. Key capabilities in IQ-Core Software for device management include:

- Adding/removing devices under management
- Real-time device interface status and bandwidth graphing
- Password and IP management
- Port security, and port configuration scripting
- Device reset
- Access/launch of device OEM UI
- Built-in VT 100 compatible terminal, providing an all-in-one location for command line access
- Filtered event information, by device
- Operator/administrator customized/scripted tabs, for Cisco IOS devices
- Support for device management through the serial connections – via an MRV Terminal Server.
Device interfaces can have scripts applied to them via the Activate/Deactivate wizards. These scripts are configurable by administrators for the specific needs of the system. An example would be to properly put a switch port into both data and voice VLANs so that a phone will work immediately when plugged in.
IQ-Core Software shows real-time status of each device, monitoring the health of key device parameters and reporting/alerting on any detected issues.
IQ-Core Software also includes a free-floating terminal window that may be used to perform command-line/terminal tasks simultaneously while using other IQ-Core Software capabilities. This enables operators/administrators to retrieve reference configuration information and conduct advanced configuration on multiple devices.
IQ-Core Software enables operators/administrators to add new devices (one at a time) to a system, to be managed by IQ-Core Software. Following the instructions in the “Add Device” wizard allows operators expand the systems under management, for example when additional switches are added to expand the number of ports in a system.
Automated Configuration Backup Management
IQ-Core Software provides a powerful automated configuration management solution for multiple devices in a system. IQ-Core Software can perform configuration backups on a daily schedule, on automatic detection of configuration changes, or on manual execution. Operators may compare configurations side-by-side on screen, with differences marked, as shown in the screen below.
Comparing two Cisco router configurations after a change was made to an interface description. This view shows all differences between two configurations and has synchronized scrolling.
**Virtual Machine Management**

IQ-Core Software supports monitoring and control of VMWare Virtual Machines. Each VM is shown with an overview of pertinent properties. Each VM and its guest can be powered on and off. This is a much quicker way to handle common VM tasks without loading the full VMWare vSphere management application.
Event Management

All device syslog messages, Windows application and security events, and internally generated events are stored in a database, and can be sent via email, depending on the severity. Each network device should be configured to send syslog messages to IQ-Core Software. Each of these events can be forwarded to northbound syslog servers as well.
Diagnostics
IQ-Core Software provides powerful diagnostic tools enabling operators and administrators to quickly pinpoint common issues.

- Real time bandwidth graphing/reporting
- IP SLA with reporting
- Extensive system logging, auditing, and system event capture
- Gather/package and export diagnostic sets
- Ping wizard

Example diagnostic tools follow:

This screen shot shows real-time bandwidth graphing/reporting for WAN interfaces.
Report data may be exported for saving or analysis by 3rd party tools.
IP SLA is a Cisco technology that means IP “Service Level Agreements”. This technology allows customers to monitor paired devices (routers and switches), to ensure that the network performance is as expected. IP SLA monitors can be created to run on schedules, and analyze and report on the performance of links between devices. Many of the IP SLA operations require a pair of IP SLA enabled Cisco devices, and many devices have different configurations – making setup complex. IQ-Core Software simplifies that complexity.
Below is an example IP SLA report showing Jitter and Latency – a key measure of IP packet performance. MOS is a measure of voice quality over that link.
IQ-Core Software contains a free-floating “Ping Wizard” that can be used to generate pings between the interfaces of any two devices that support it. This handy capability allows operators to check the connectivity/status of devices, while simultaneously performing other commands/tasks in IQ-Core Software.
Custom Diagnostics/Wizards
Additionally, PacStar is able to create custom diagnostic tools to assist customers with specific issues – shown below is a VoIP "Call Flow View" diagnostic solution created to assist in the setup of voice systems over Cisco UCM, NET SHOUT 900 (VX 900), and Cisco Routers – traversing a SATCOM link. The solution includes real-time call debugging.

![Call Flow View Diagram](image)
To further help troubleshoot problems, the Call Flow View can monitor a phone call in real-time and analyze low-level debug messages to determine the cause of call failure.
Roles-Based Operation Administration

IQ-Core Software manages administrators through a roles-based access system. Custom roles may be defined that allow access to basic or advanced features, and users authorized to operate a system can be assigned those roles.

This mechanism enables advanced administrators to set up roles and assign access rights based on roles. Users of IQ-Core Software (system operators) may be given limited access rights, for example, “view only” types of capabilities, or may have other types of restrictions such as no access to device command lines; while more advanced operators may be given more capabilities.

Below is the roles screen showing sample roles, users assigned to roles, and role capabilities.
The wizard below shows how administrators can easily change capabilities and rights assigned to a role.
Utilities for Power Users and Entry-Level Operators Alike

IQ-Core Software provides additional integrated utilities that save time and simplify tasks for power users and entry level operators performing a wide variety of diagnostics and configuration tasks. Utilities include:

- IQ-Core Software profiles and snapshots
- Integrated file transfer server
- Named credentials (password vault)
- Notepad

Example utility wizards follow:

IQ-Core Software includes extensive capabilities that speed the installation and configuration of IQ-Core Software. Using the SnapShot and Profiles wizards, administrators and operators can quickly clone the complete IQ-Core Software configuration (including adding devices in bulk) from one system to another, saving large amounts of time, especially when creating/configuring multiple systems.

When creating dozens or thousands of systems managed by IQ-Core Software, this wizard can ensure consistent configuration across all systems. This capability is especially helpful for managing systems with many devices where IP address templates are partially specified, but must be tailored for each system.
IQ-Core Software includes an integrated file transfer server enabling operators and administrators to transfer files to/from devices under the management of IQ-Core Software using SFTP, FTPS, SCP and TFTP. The integrated screen includes SSH access to command-line driven devices, and a display of the file server folders. Using the IQ-Core Software client, you can upload/download files to/from the server.

This general-purpose utility enables file transfer of configuration information, logs and other ad-hoc information that operators/administrators may need on an occasional basis.
IQ-Core Software includes an encrypted password vault-like wizard called “Named Credentials” – that enables operators to save sets of users/password combinations to be used to manage devices. As the number of passwords proliferate on devices, this wizard helps operators keep track of them all, reducing time spent looking up or resetting forgotten passwords.

IQ-Core Software includes an integrated, free-floating notepad feature that enables operators and administrators to take temporary notes during tasks, reducing the requirement to memorize IP addresses and other configuration information that may need to be available through multiple diagnostic steps.
Context-sensitive Online Help/Manual
Operators only need to press the F1 key, or click on the “Help” button in wizards, and IQ-Core Software launches the operator help system. The innovative help system “follows along” with operators as they navigate through the system, eliminating the need for operators to search through topics.
Supported Devices and Systems
Below is the list of the devices and software systems that existing IQ-Core Software applications monitor and control. PacStar continually expands this list, and is interested in working with customers and partners to support additional devices, as needed.

- Acme Packet Net-Net 3800 Session Border Controller
- Aruba Networks Mobility/Branch Controller
- Avaya Aura Application Server AS5300 LSC
- Avaya ERS 4500 Switches
- Brocade FCX-Series Switches
- Cisco ASA 5500-Series Security Appliances
- Cisco Routers, including:
  - ISR 8xx, 18xx, 28xx, 38xx
  - ISR 9xx, 19xx, 29xx, 39xx
  - ESR 5915
- Cisco Switches, Including:
  - Catalyst 3560
  - Catalyst 3750
  - ES 2020
- Cisco Unified Communications Manager
  - Versions 7.x, 8.x
- Cisco Unified Communications Manager Express
- Cradlepoint Wireless Routers
- DRS Universal Power Systems UPS 2000TR-III
- iDirect Evolution 8000 Series Satellite Router
- Microsoft Active Directory
- Microsoft Exchange
- Microsoft Windows servers and workstations
- MRV Terminal Server
- PacStar 4400 UPS
- NET VX 400 & 900
- Nexus Hawk Mobile IP Router
- REDCOM SLICE & HDX
- Riverbed Steelhead WAN optimizers
- VMWare vSphere 4.x and 5.x
- Vocality BASICS modules
  - Router
  - Relay
  - Voice
  - Four Wire
  - Hybrid
- Generic Network Devices using industry standard protocols

Additional devices supported on request
Sample Functionality
Below is a categorized list of many of the functions in existing IQ-Core Software editions.

Dashboard and Real-time Data
IQ-Core Software has an efficient mechanism to capture and process system information in real-time. Examples include:
- Device up/down states
- Phone call statistics (attempts, in use, etc.)
- Router and switch interface states
- Device internal temperatures

Unattended Monitoring/Alerting, Auditing
IQ-Core Software consolidates events from devices (syslog or SNMP), Windows event logs, Cisco IP SLA, and internally-detected conditions.
- Real-time event views as they happen
- Events persisted for troubleshooting past problems
- Alerts generated for important events
- System usage/auditing, by user

Automated Configuration Management, Backup/Restore/Compare
IQ-Core Software can quickly retrieve configurations for controlled devices and then restore those configurations at any time.
- Back up the configuration for one or more devices
- Backups of configurations are compressed into a single file when exported.
- Restoration of one or more backups of device configurations
- Backups of configurations can be downloaded from remote locations
- Backups of device configurations can be scheduled or taken based on automated change detection

Device Management
IQ-Core Software has functions to monitor and control supported hardware or software devices. Examples include:
- Device status
- Monitor/control device interfaces
- Real-time bandwidth graphs, by interface
- Device event reporting
- Soft reset
- Add/remove device
- Change password with integrated named credentials (password vault)
- Fast console (SSH) access (no need to manually log in)
- Customized tabs executing operator-defined IOS commands
- Smart VM shutdown
- Ping directly from devices for troubleshooting
**User Provisioning and Management (Move, Add, Change)**
Adding and configuring users can be a complicated, error-prone process. IQ-Core Software enables operators to quickly and easily perform add/change/deletes to a system.
- Adding/Deleting different types of users with different permissions, including adding users to Active Directory
- Associating users with phones
- Adding/deleting associated MS Exchange email mailboxes
- Bulk import and export of user settings

**Network Performance Data**
IQ-Core Software can retrieve network and phone trunk statistics in real-time.
- Trunk channel usage
- Phone statistics summary
- Server memory and disk usage
- Data retrievable by time period
- Consolidates and correlates disparate data from multiple devices/systems
- May integrate with any external management systems capable of reading XML formatted information.

**Phone and Line Configuration/Provisioning**
Adding and configuring phones and lines can be a complicated, error-prone process. IQ-Core Software enables operators to quickly and easily configure the phone system.
- Add and remove analog, BRI, and VoIP phones
- Comprehensive display of phone and line information
- Phone numbers can be associated with user names
- Phone type, IP, MAC, and registration state
- MLPP configuration
- Search space, partition settings
- Route plan viewing
- Bulk import and export of phone settings

**Call Detail Records (CDRs)**
IQ-Core Software stores call information so that historical call information can be viewed at any time. Call information includes:
- Source phone number
- Destination phone number
- Source trunk when available
- Call start time
- Call stop time

**Call Management Reports**
IQ-Core Software provides extensive call quality and volume reporting for Cisco UCM, including:
- Call volume and top callers reports
- Call quality reports
- Trunk statistics
- Reports by phone
Diagnostics
IQ-Core Software contains powerful utilities to facilitate troubleshooting. Examples include:
- Bandwidth/interface utilization
- View real-time network port information
- Quick ping any IP address
- Cisco IP SLA
- Shut down or re-start the IQ-Core Software system

Utilities
IQ-Core Software contains powerful built-in utilities to save time and simplify management tasks.
- IQ-Core Software snapshot and profiles
- Integrated file transfer server providing SCP, SFTP, TFTP services
- Integrated notepad
- Encrypted password vault

Performance Overview
IQ-Core Software has numerous mechanisms to ensure great performance, even when multiple IQ-Core Software clients are using the same IQ-Core Software server over slow or latency-prone transmission links such as SATCOM.

Efficient Client-Server Communications
The IQ-Core Software client is an installable application and is not browser-based. This allows the software to rely on more efficient methods of user interface control and data transfer. When an operation returns data to the IQ-Core Software client, it is only the actual data that is being transferred. Given that well over 50% of most web pages are filled with user-interface graphics, this architecture is a performance booster relative to browser-based applications, especially over slow, remote links (such as satellite).

Below is an example session showing very low bandwidth utilization for the IQ-Core Software client running remotely. During monitoring, bandwidth hovers around 1 to 2 Kbps, with occasional small peaks.
Hardware Requirements
IQ-Core Software is a highly efficient application with low computational overhead and requirements.

**IQ-Core Software Server**
Any Windows 7/8 or Windows Server platform. The IQ-Core Software server typically requires 100MB of memory and 100MB of disk storage, depending on load. The IQ-Core Software server is a Microsoft .NET application that runs as a Windows service. It relies on an SQL Server Express database to store events and other data.

**IQ-Core Software Client**
Any Windows 7/8 or Windows Server platform. The IQ-Core Software client typically requires 100MB of memory and 100MB of disk storage. The IQ-Core Software client is a Microsoft .NET application.

For best performance, PacStar recommends **systems** with at least a 1.5 GHz Intel architecture CPU, 2 GB RAM, and 5 GB of disk space available.

**PacStar IQ-Core Software Summary**
IQ-Core Software simplifies, automates, and unifies the configuration and management of diverse, complex, networking and communications equipment. It is designed to be used by:

- Lightly-trained personnel, reducing training time and usage errors, and improving uptime.
- Advanced administrators, automating routine tasks and saving time
Reduced Training, Reduced Deployment Headcount, Reduced Travel
Solutions using IQ-Core Software are designed to be easy to use and to prevent misconfiguration of the system. Solutions using IQ-Core Software expose functions that are most important for operators, and hide the complexity as much as possible. This helps reduce training requirements, and enables organizations to set up and maintain systems with entry-level staff.

Solutions using IQ-Core Software are designed to be deployed or installed in remote locations. By providing extensive, efficient, and remote management, many monitoring and routine tasks can be performed from central office locations.

Speeding Configuration/Troubleshooting and Routine Tasks
For advanced administrators, IQ-Core Software saves time by automating routine tasks and providing integrated access to the devices on a network, as well as providing integrated wizards and utility tools that work together seamlessly.

Faster Deployment, Lower Maintenance
Solutions using IQ-Core Software are designed to be quickly deployed. IQ-Core Software assists in system setup by informing operators when there are problems, by assisting in configuration through easy-to-use wizards, and by providing useful diagnostic tools.

Secure
Solutions using IQ-Core Software operate in military environments with the highest security requirements. IQ-Core Software is designed, installed and configured to meet security requirements, and has been tested on multiple DoD JITC certified solutions.