PacBio

Vega™ system

Site preparation guide

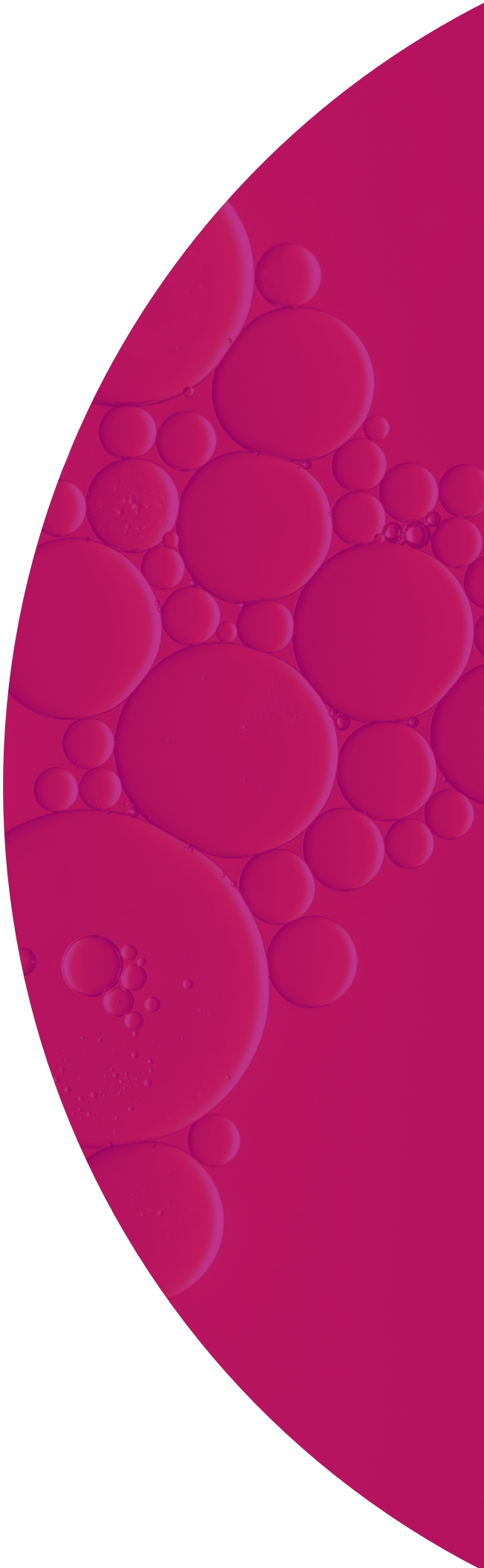

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Table of contents

Introduction **4**

Overall site preparation recommendations 4

Safety considerations 4

Delivery and installation **4**

For more information *4*

Shipment of the Vega system will include the following: 5

Vega system crate *5*

Equipment and materials for installation *5*

Required personnel **6**

Site preparation manager *6*

Laboratory safety manager *6*

Laboratory personnel *6*

Lab space requirements **7**

Instrument dimensions 7

Instrument placement requirements 8

Lab bench considerations: *9*

Vibration considerations: *9*

Sequencing consumable storage conditions 9

Environmental considerations **10**

Environmental specifications 10

Electrical requirements **10**

Power specifications 10

External ground connection *10*

Power cords and receptacles *10*

Uninterruptable power supply (UPS) *11*

Network and compute requirements **12**

Instrument connectivity and networking 12

Sequencing data storage 12

SMRT Link server installation 13

SMRT Link and SMRT Link Cloud features *13*

SMRT Link and SMRT Link Lite configuration *13*

SMRT Link Cloud configuration *17*

Limited product warranty **18**

Technical assistance **18**

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PN 103-516-500 REV01 NOV2024

Introduction

The site preparation guide explains how to prepare your physical laboratory to accommodate the Vega sequencing system. PacBio® personnel will support you to install and test the system.

SMRT® Link software must be installed on the computer network to which the Vega system will be attached by the scheduled physical installation date. If SMRT Link is not available, then PacBio maintains the option to complete the instrument installation process (including Installation Completion Testing), without connecting the Vega system to the your computer network.

A PacBio representative will contact you, at least 2 weeks prior to shipment, to confirm that site preparation is complete. Be sure to point out any potential installation limitations or hindrances to the installation.

Overall site preparation recommendations

- Read and familiarize yourself with all of the safety information, symbols, and conventions.
- Assign the required personnel.
- Select the site and space.
- Complete all environmental, electrical, and computer requirements.
- Ensure your site is appropriately stocked with the needed materials. Only supported consumables and accessories may be used with the Vega system.
- Install the most recent version of SMRT Link software.
- In cases of limited user accessibility to the instrument work deck or controls, appropriate accommodations must be made by the your site according to local regulations.

Safety considerations

Safety notes, cautions and warnings are contained in this Guide. For additional informarmation refer to the *Safety Guide Vega System* Read and follow all safety recommendations.

Delivery and installation

An authorized service provider contracted through PacBio delivers, uncrates and places the instrument on its designated lab bench. Ensure the lab space is ready before delivery.

Important: Consumables may be delivered at a different time. When consumables arrive, immediately place them in suitable cold storage according to the packaging label.

	Caution Only authorized personnel can uncrate, install, or move the **Vega system**. Mishandling of the instrument could lead to hardware damage which will impact system performance and **may void any existing warranties.** If the system needs to be relocated, please contact your PacBio field representative to schedule a service visit.

For more information

For more information or support, contact your PacBio representative or call 1-877-920-7222.

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PN 103-516-500 REV01 NOV2024

Shipment of the Vega system will include the following:

- Vega system crate
- Vega accessory box
- Vega instrument

Vega system crate

The Vega system will arrive in a crate with the following dimensions. The weight includes the weight of the crate and the Vega system.

Crate	Measurement
Width	36.8 in (93.7 cm)
Height	49.7 in (126.4 cm)
Depth	31.4 in (79.7 cm)
Weight	476 lbs (215.9 kg)

Equipment and materials for installation

Equipment	Quantity	Source
Ice bucket	1	Major Laboratory Supplier (MLS)
Ice	1	MLS
Lab gloves	1	MLS
Vortex-Genie shaker	1	VWR Catalog No. 14005-824
Plate centrifuge	1	MLS
Micropipettors and filter tips for p2, p10, p20, p100, p200, p1000	1	Thermo Fisher Scientific, Rainin (Mettler Toledo), USA Scientific
Molecular Biology Grade H_2O	1	MLS
Isopropyl Alcohol (70%-99%)	1	MLS
Rotator	1	VWR PN 13916-822 / 13916-824 / 13916-828 / 13916-826
Centrifuge tubes	1	Thermo Fisher Scientific, Rainin (Mettler Toledo), USA Scientific

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Required personnel

This section assigns certain tasks to various personnel in an effort to have all aspects of system receipt, installation, and operation proceed as planned.

To minimize the time between shipment arrival and system installation:

- Complete the site preparation requirements and fill out the corresponding Vega system site preparation requirements checklist (Checklist).
- Schedule installation before the System shipment arrives.
- Verify with a PacBio representative (who will contact you) that:
  - All tasks and the Checklist are complete.
  - The purchase order is complete.

Site preparation manager

- Reviews this Site Preparation Guide for requirements and chooses the installation site.
- Coordinates required personnel and tasks.
- Orders required materials.
- Reviews the Checklist with appropriate personnel, then with the PacBio Service Engineer to verify that the site is properly prepared.
- Receives the system.
- Schedules the installation and informs personnel of the installation date.
- Ensures that the site is clear of unnecessary materials on the installation day.
- Is available to assist the Service Engineer throughout installation.

Laboratory safety manager

- Reviews this Site preparation guide for safety information.
- Ensures that the required safety practices and equipment are in place.
- Is available to assist the Service Engineer throughout system installation.

Laboratory personnel

- A primary user who will be trained during installation and will be responsible for training other users.
- Ensures that customer-supplied materials are on hand.

Facilities manager

- Ensures that installation requirements are met for:
  - Space at the installation site
  - Building clearances
  - Temperature and humidity
  - HVAC capacity
  - Waste collection
  - Electrical supply
  - Computer
  - Safety and installation materials
- Is available to assist the Service Engineer and laboratory personnel throughout installation.

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Network/IT manager

- Ensures all connections, setup, and installation requirements are complete prior to instrument installation.
- Ensures all requirements set forth in the Checklist are complete.
- If necessary, supplies additional cables
- Is available during installation to connect the System to the network

Lab space requirements

The Vega system requires sufficient lab space and a robust lab bench to enable system operation and instrument servicing. This section will describe the instrument dimensions and lab space requirements.

Instrument dimensions

The following describes the dimensions for the Vega system.

Measurement	Dimension
Width	21.9 in (55.7 cm)
Height	30.2 in (76.8 cm)
Depth	27.4 in (69.5 cm)
Weight	276 lbs (125.2 kg)

Figure 1. Vega instrument, front view

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Measurement	Dimension
Depth with drawer open	33 in (83.8 cm)

Figure 2. Vega Instrument with the reagent drawer extended

Caution: DO NOT lean or place anything other than consumables for sequencing on the reagent drawer as this may damage the instrument.

Instrument placement requirements

The following describes the requirements for access and clearance dimensions to enable proper airflow and accessibility for servicing the instrument.

- The Vega system should be placed away from sources of direct sunlight exposure.
- The instrument should be accessible from all sides using the following minimum clearance dimensions.

Access	Minimum clearance
Sides	12 in (30.5 cm)
Rear	6 in (15.2 cm)
Top	30 in (76.2 cm)

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Lab bench considerations:

Placement of the Vega system requires a lab bench that can support the weight and dimensions of the instrument.

- It is strongly recommended that the designated lab bench has locking casters installed to facilitate the installation, maintenance and servicing of the instrument.

The following table lists the recommended lab bench dimensions to support the Vega system.

Measurement	Min. Bench Dimensions
Width	48 in (121.9 cm)
Height	36 in (91.4 cm)
Depth	30 in (76.2 cm)

For customers in North America, PacBio recommends the following lab bench: Global Industrial Model #WB319359TN

Vibration considerations:

The Vega system must be placed in a location that minimizes exposure to sources of external vibrations to ensure optimal instrument performance during sequencing. The following are best practices to minimize exposure to external vibrations:

- Ensure the lab bench is sturdy and clear of equipment that causes vibrations such as a vortex shaker or a centrifuge.
- Avoid placing objects on the top panel of the system.
- While the instrument is sequencing, minimize vibrations on the floor near the system from personnel or adjacent equipment.

Sequencing consumable storage conditions

The sequencing consumables for the Vega system are temperature sensitive and require proper storage. Use the following table to ensure proper storage of the consumables.

Note: When the consumable kits arrive, immediately unpack and place the kit contents in the appropriate area to accommodate the storage conditions for each consumable as indicated in the following table:

Kit name	Storage conditions
Vega Cell Tray	RT
Vega Sequencing Plate	-20°C

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Environmental considerations

Environmental specifications

The following table lists the environmental specifications for the Vega system.

Element	Specifications
Temperature	Maintain a lab temperature of 19°C to 25°C with a maximum temperature fluctuation of 2°C per hour.
Humidity	Maintain a noncondensing relative humidity between 20–80% with a maximum dew point of 15°C.
Elevation	Locate the instrument at an altitude below 2000 meters (6500 feet).
Air Quality	Operate the instrument in a Pollution Degree II environment or better. A Pollution Degree II environment is defined as an environment that normally includes only nonconductive pollutants.
Heat Output	Maximum thermal output is 4250 BTU/hr.
Noise Output	Maximum noise level of 70 dBA.

Electrical requirements

This section lists the power specifications and facility electrical requirements for the Vega system.

Power specifications

Component	Peak Power Consumption	Line Voltage
Vega System	1,250W	100-240 VAC at 50/60 Hz

External ground connection

A 7.6m long 6AWG (or 16 mm2) Green/Yellow external grounding cable terminated with a 1/4" lug is supplied for the instrument. You must supply a minimum 6 mm (1/4") grounding stud that is compliant with local electrical codes.

The grounding cable will be fastened to the M6 Ground Stud on the back of the system and run to the facility's earth ground connection.

Note: This 20 AMP ground is redundant in case of an internal short or leakage current. If the power plug is disconnected there may be a large amount of AC energy stored in the capacitors and the AC power supply internal to the instrument.

Power cords and receptacles

PacBio provides an instrument power cable in the accessories kit that will be configured specifically to the region by the Service Engineer during the installation of the system. The lab facility requires the following to operate the Vega system:

- For 100-120 VAC- A 20 amp grounded line with proper voltage.
- For 200-240 VAC – A 10 amp grounded line with proper voltage.

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Component	Length of Cable	Type	Receptacle
Main instrument power cable	10 ft 3.1 m	NEMA 5-20P	NEMA 5-20R
Ground Cable	25 ft 7.6 m	1/4” Lug	6 mm (1/4”) Ground Stud

Uninterruptable power supply (UPS)

Powering the Vega system via an uninterruptible power supply (UPS) is highly recommended. PacBio is not responsible for sequencing runs impacted by interrupted power.

The following tables list recommended UPS options for International and North American customers:

North America Recommendation	
UPS	APC Smart-UPS, Line Interactive, 2200VA, Tower, 120V, 8x NEMA 5-15R+2x NEMA 5-20R outlets, SmartConnect Port+SmartSlot, AVR, LCD
Nominal Input Voltage	120VAC
Output Capacity	1920 W/ 1920 VA
Frequency Compatibility	50/60 Hz
Input Connection Type	NEMA 5-20P
Output Voltages Supported	110V; 120V; 125V
Dimensions (DxWxH)	21.4 in x 7.7 in x 17.1 in (54.4 cm x 19.6 cm x 17.1 cm)
Weight	112.2 lbs (50.9 kg)

International Recommendation	
UPS	APC Smart-UPS, Line Interactive, 2200VA, Tower, 230V, 8x IEC C13+2x IEC C19 outlets, SmartConnect Port+SmartSlot, AVR, LCD
Nominal Input Voltage	230VAC
Output Capacity	2200 VA
Frequency Compatibility	50/60 Hz
Input Connection Type	IEC 320 C20 Schuko CEE 7 / EU1-16P BS1363A British
Output Voltages Supported	220V; 240V
Dimensions (DxWxH)	54.4 cm x 19.7 cm x 43.5 cm
Weight	50.2 kg

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Network and compute requirements

Instrument connectivity and networking

An active, tested LAN connection must be in place before the scheduled installation date. The following are requirements for instrument connectivity on your network.

Instrument connection to your network

- 1GbE or better link speed required between instrument and sequencing storage server or network
- One static or DHCP IP address, with subnet mask and gateway for static
- For PacBio Insight (remote support) customers, outbound port 22/tcp, 80/tcp, and 443/tcp should be opened to region specific SecureLink servers detailed below.
- Domain Name System (DNS) default search domain (optional)
- DNS server addresses (optional)
- Network Time Protocol (NTP) server addresses (optional)

Remote support with PacBio Insight

PacBio Insight enables PacBio service and support to remotely monitor and service instrument per customer request. In order to enable PacBio Insight, the IT/Network administrator must open Port 22, 80, 443/TCP outbound from the Vega system to the following SecureLink servers:

Instance	Servers	Ports Required
US	securelink-us.pacificbiosciences.com securelink-us-001.pacificbiosciences.com 34.228.163.151 securelink-us-002.pacificbiosciences.com 18.207.27.182	22, 80, 443/TCP
EMEA	securelink-emea.pacificbiosciences.com securelink-emea-001.pacificbiosciences.com 3.122.45.57 securelink-emea-002.pacificbiosciences.com 3.121.132.217	22, 80, 443/TCP
APAC	securelink-apac.pacificbiosciences.com securelink-apac-001.pacificbiosciences.com 3.0.254.58 securelink-apac-002.pacificbiosciences.com 13.251.34.130	22, 80, 443/TCP

Note that PacBio Insight is customer-configurable for access and control restrictions. Please contact PacBio for details.

Sequencing data storage

All Vega system require customer-provided local or cloud storage for sequencing data at installation. Direct-to-cloud data transfer is supported for: Amazon S3, Google Cloud Storage, and Microsoft Azure Blob Storage. The amount of storage required for sequencing data is dependent on system utilization.

Storage requirements

Sequencing data **(**assuming approximately 30GB of HiFi data per SMRT Cell and utilization at 200 SMRT Cells per year) is up to 6TB/year.

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SMRT Link server installation

SMRT Link is the PacBio software required for instrument management, sequencing run setup, and sequencing run quality control. It can optionally be configured to run select analyses. SMRT Link is available for a local compute environment on customer-provided hardware or as PacBio-hosted SMRT Link Cloud.

Compute requirments, networking configuration, and software features are different for a local SMRT Link server or SMRT Link Cloud. See the corresponding information and requirements, for each installation type, available in this document and the SMRT Link installation guide (v25.1+) and SMRT Link Cloud guide.

Refer to https://www.pacb.com/support/software-downloads/ for the latest SMRT Link software download and documentation.

SMRT Link and SMRT Link Cloud features

Your analysis needs and compute resources will inform which SMRT Link option is the best fit. To learn more about analysis features please visit https://pacb.com/smrt-link/ or refer to the SMRT Link user guide at https://www.pacb.com/support/software-downloads/.

	SMRT Link	SMRT Link Lite	SMRT Link Cloud
Instrument management	Y	Y	Y
Run setup and QC	Y	Y	Y
Push-button secondary analysis (SMRT Analysis)	Y	N	N
3rd party and PacBio Compatible Partner analysis	Y	Y	Y
API access	Y	Y	N

SMRT Link and SMRT Link Lite configuration

A SMRT Link server is locally hosted on customer-provided hardware and includes support for SMRT Analysis (PacBio analysis workflows) if configured with the required hardware (see SMRT Link requirements). SMRT Link Lite, is a lightweight local installation of SMRT Link and only includes instrument management, run setup, and run QC.

SMRT Link requirements

Software prerequisites: Server operating system

- SMRT Link server software is supported on English-language Rocky Linux 8.x and 9.x., Ubuntu 20.04 Linux® (until end-of-life on 4/1/2025), and Ubuntu 22.04 Linux®.This also applies to SMRT Link compute nodes.)
- SMRT Link is not guaranteed to work on operating system versions which are no longer supported by their vendors.
- SMRT Link server software cannot be installed on Mac OS or Windows system.
- Configuring your SMRT Link server with the Job Management System (JMS) SLURM is recommended. Sun Grid Engine (SGE), PBS, and LSF are also supported.

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Software/Hardware prerequisites: Client operating system/Web browser

To use SMRT Link on a client operating system:

- SMRT Link requires the Google Chrome web browser, version 83 or later.
- SMRT Link requires a minimum screen resolution of 1600 by 900 pixels.

SMRT Link server configuration requirements

Component	SMRT Link (head node) + HPC node	SMRT Link (single node)	SMRT Link Lite
CPUs	8 cores	16 cores/32 threads	4 cores
RAM	32 GB	64 GB	16 GB
Local storage	500 GB SSD	1 TB SSD	50 GB SSD

HPC node configuration recommendations

Component	Recommendation
CPUs	64
RAM per core	4 GB
Local storage	100 GB SSD or HDD

SMRT Link servers configured with an HPC node are required to support running Variant Calling analysis and larger Iso-Seq® Analysis jobs (>20M reads).

Analysis data storage

A local and full SMRT Link installation includes SMRT Analysis which offers push-button analyses for select utilities and applications. To learn more about analysis features please visit https://pacb.com/smrt-link/ or refer to the SMRT Link user guide at https://www.pacb.com/support/software-downloads/.

Analysis data storage must be a shared file system and networked with both the SMRT Link server and any HPC nodes. Storage of files produced by SMRT Analysis will approximately double the per SMRT Cell storage requirement. The amount of analysis storage required will depend on your utilization and analyses used.

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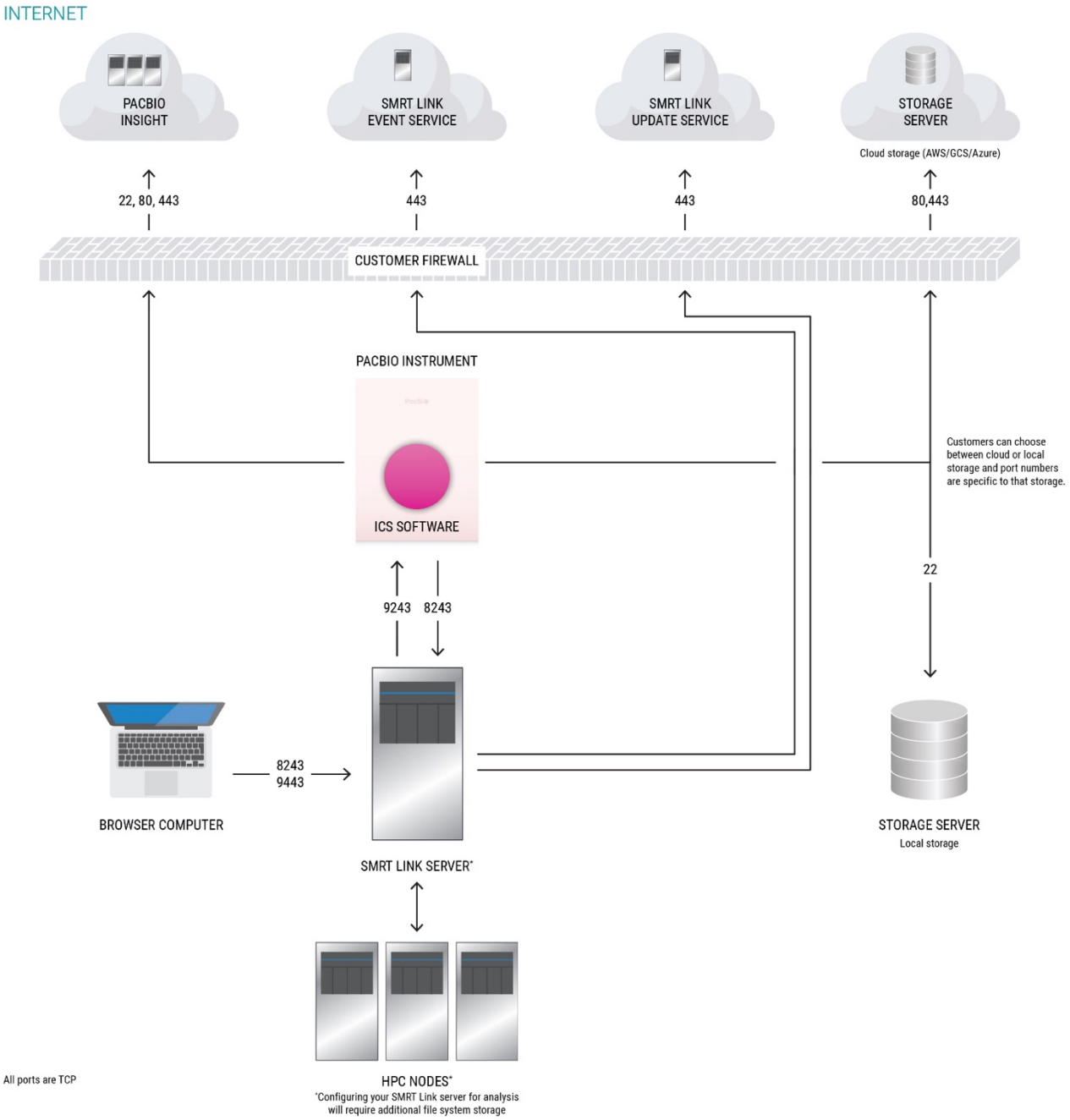
Vega and SMRT Link, including SMRT Link Lite, network diagram



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Ports and firewalls

The graphical web interface for locally-hosted SMRT Link requires that web browsers can access the HTTPS port `8243`, which serves up the password-protected services API and static web content. This port is also used by the Vega system. Therefore, it needs to be available to any Vega instrument as well. Similarly, there is return communication from the SMRT Link server to the Vega system on HTTPS port `9243`.

- If your network is already configured to leave these ports open, no additional changes are required.
- If you have restricted access to port `8243` to localhost (meaning the GUI can only being viewed in a browser running on the SMRT Link server itself) or specific remote hosts, exceptions allowing the Vega instrument(s) to communicate with port `8243` on the SMRT Link server are required.
- If you have restricted access to port `9243` to localhost, exceptions allowing the SMRT Link server to communicate with port `9243` on the Vega instrument(s) are required.

SMRT Link update service

The **SMRT Link Update Service** will provide automatic notification and installation of available updates to components of the current version of SMRT Link software.
The network destination http://smrtlink-update.pacbcloud.com:8084 must be allowed to enable this service.

SMRT Link event service

The SMRT Link Event Service can be used to send information to the PacBio Technical Support Team to troubleshoot installation and analysis failures.

Vega system and SMRT Link, or SMRT Link Lite, network ports and protocols.

Source	Destination	Port/Protocol	Description
Vega system	SecureLink Servers	22/tcp, 80/tcp or 443/tcp	Communication for remote support (PacBio Insight)
Vega system	Storage (Cloud or local)	RSYNC over SSH: 22/tcp, or Cloud: 80/tcp and 443/tcp depending on protocol	Data transfer from instrument to customer storage
Vega system	Customer or external NTP servers	123/udp	Used for updating machine time. Defaults to pool.ntp.org
Vega system	Customer server	53/udp or 53/tcp	Nameservers
Vega system	SMRT Link server	8243/tcp	Communication from instrument to SMRT Link
SMRT Link server	Vega system	9243/tcp	Communication from SMRT Link to instrument
Customer laptop/ desktop PC	SMRT Link server	8243/tcp	SMRT Link web services and GUI https
Customer laptop/ desktop PC	SMRT Link server	9443/tcp	Optional SMRT Link Administration https (API Management Interface)
SMRT Link server	Shared Network File System (NFS) [a]	NFS ports (may vary depending on configuration)	Shared file system (NFS) storage for analysis data
SMRT Link server	PacBio Event server (https://smrtlink-eve.pacbcloud.com:443)	443/tcp	Optional reporting of server metrics to PacBio Tech Support
SMRT Link server	PacBio Update server (https://smrtlink-update.pacbcloud.com:8084)	8084/tcp	Downloading Chemistry Updates
HPC nodes	Shared Network File System (NFS) storage[a]	NFS ports (may vary depending on configuration)	Shared file system (NFS) storage for analysis data

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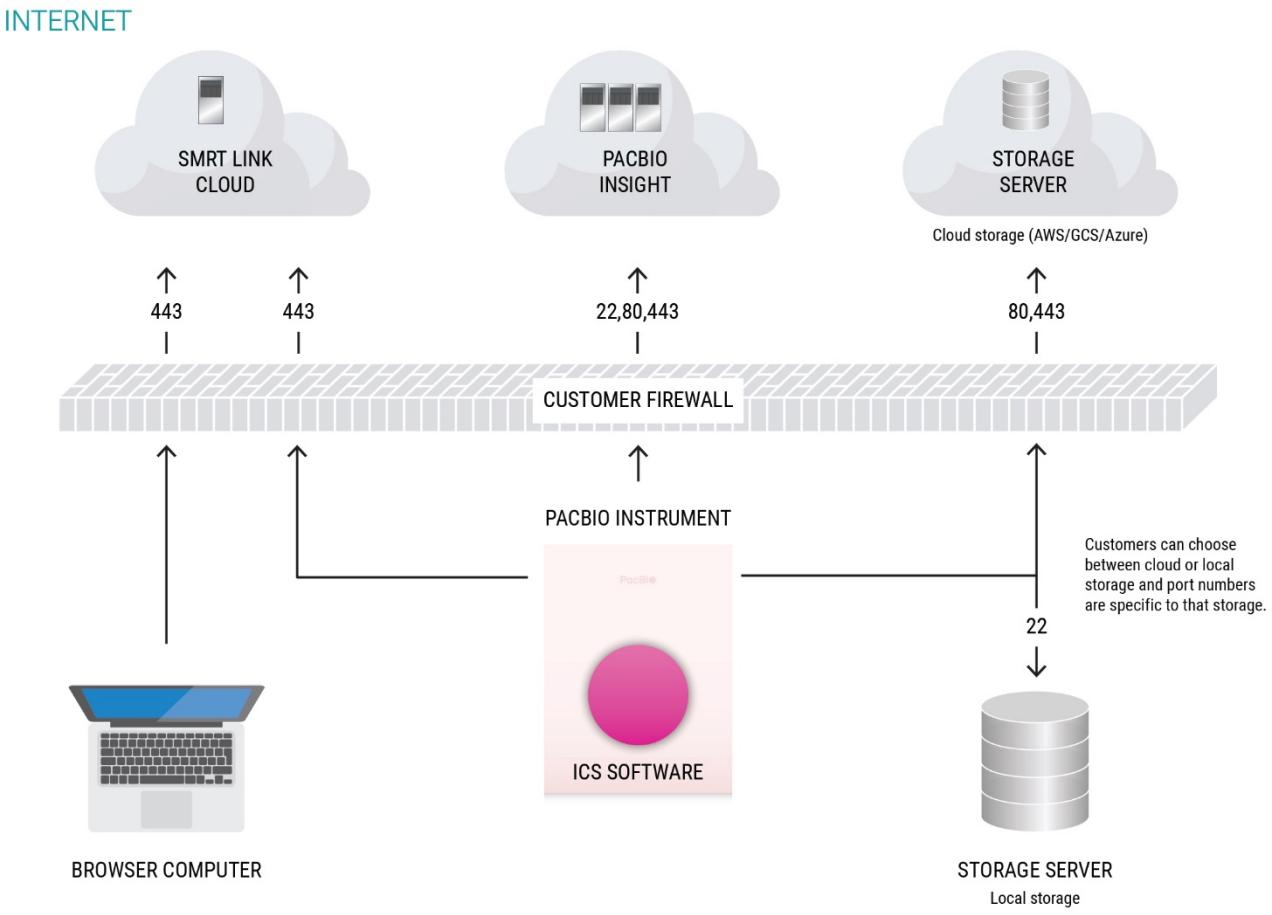
Network file system requirements

- If used, NFS mounts to the input and output locations.
- HPC compute nodes must be able to write back to the NFS.
- Additional file system storage may be required if using SMRT Link for analysis. This approximately doubles the storage requirement

SMRT Link Cloud configuration

SMRT Link Cloud is a PacBio hosted SMRT Link service. Its features include instrument managment, run setup, and run QC. Refer to https://www.pacb.com/support/software-downloads/ for the latest SMRT Link software documentation. To setup SMRT Link Cloud please contact your local Field Applications Bioinformatics Support scientist.

Vega and SMRT Link Cloud network diagram



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Ports and firewalls

SMRT Link Cloud communicates exclusively on port 443 for both GUI and API users; no additional ports need to be opened to operate this product.

Vega system and SMRT Link Cloud network ports and protocols.

Source	Destination	Port/Protocol	Description
Vega system	SecureLink Servers	22/tcp, 80/tcp or 443/tcp	Communication for remote support (PacBio Insight)
Vega system	Storage (Cloud or local)	22/tcp, 873/ tcp, or 80/tcp and 443/tcp depending on protocol	Data transfer from instrument to customer storage
Vega system	Customer or external NTP servers	123/udp	Used for updating machine time. Defaults to pool.ntp.org
Vega system	Customer server	53/udp or 53/tcp	Nameservers
Vega system	SMRT Link Cloud	443/tcp	Communication from instrument to SMRT Link
Customer laptop/ desktop PC and ICC	SMRT Link Cloud	443/tcp	SMRT Link web services and GUI https

Limited product warranty

PacBio and/or its affiliate(s) warrant their products as set forth in the PacBio General Terms and Conditions of Sale. If you have any questions, please contact PacBio at support@pacb.com.

Technical assistance

For technical assistance, contact Technical Support.

Email: support@pacb.com Telephone: 1-877-920-7222, option 1

Revision history (description)	Version	Date
Initial release.	01	November 2024

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