# Xenium Analyzer:
# Network Connectivity Guidelines

## Introduction

Xenium In Situ is the next-level in situ solution for subcellular profiling of hundreds of RNA targets. Xenium Analyzer combined with curated & customizable panels, powerful visualization software, and easy-to-follow workflow is a powerful in situ profiling platform, revealing new insights into cellular structure and function.

This Technical Note provides network connectivity guidelines for the Xenium Analyzer to enable remote performance monitoring and troubleshooting to reduce unplanned instrument downtime, minimize run failures, and sample loss.

The Xenium Analyzer enables high-throughput in situ experiments along with real-time onboard data analysis. The instrument has a highly interactive user interface paired with network connectivity, intended to provide a seamless user experience along with efficient remote performance monitoring to minimize instrument downtime. If any unexpected instrument errors occur, the user-controlled remote support access to the instrument allows 10x Genomics Support team to quickly troubleshoot the errors. See the following sections for detailed information.

*Refer to the Xenium Analyzer user guide (CG000584) for details regarding various instrument components, user interface navigation, and all additional features.*
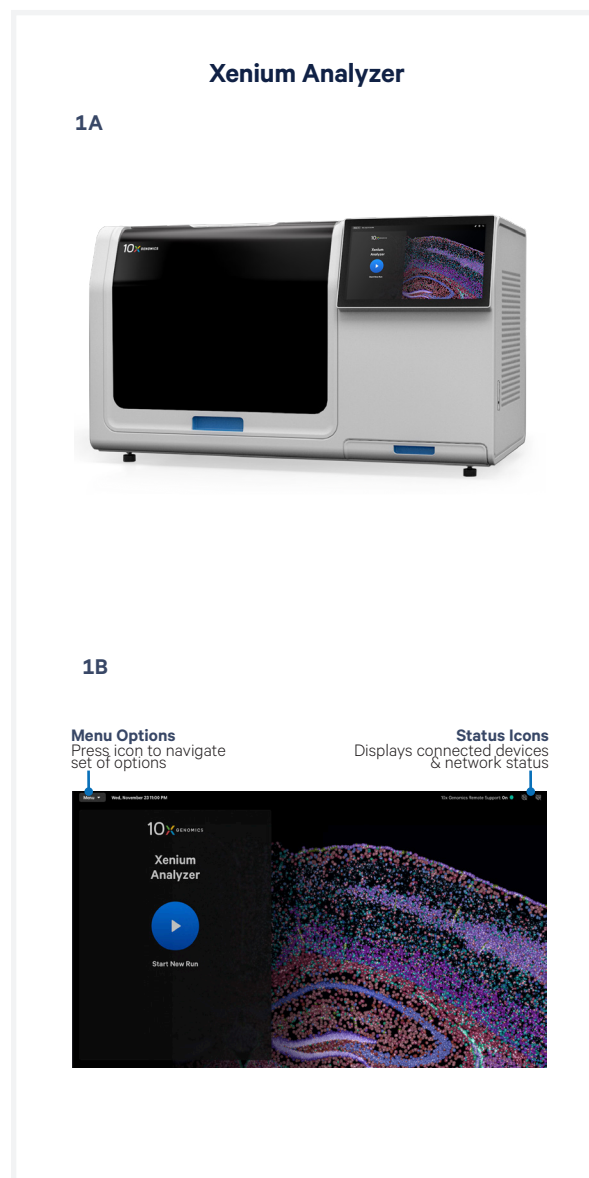


**Xenium Analyzer**

**1A**

**1B**

**Menu Options**
Press icon to navigate set of options

**Status Icons**
Displays connected devices & network status

**Figure 1.** Xenium Analyzer (1A) has a user-friendly interface (1B) that displays the network connectivity status.

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# Remote Performance Monitoring

Monitoring the performance of Xenium Analyzer helps ensure that the instrument is performing optimally and maximizes instrument uptime.  This also gives 10x Genomics the ability to respond quickly and troubleshoot any issues that may occur.  While the user focuses on processing samples and data collection, the instrument will proactively collect performance data  to allow the 10x Support Team to address any potential instrument downtime.

### Data Collected by 10x Genomics

No biological sample data is collected by 10x Genomics. Remote data collection is limited to the following items:

- Calibration data

- Instrument operation logs

- Optical, mechanical, and fluidic system logs

- Computer system logs

### Data Protection

All aforementioned collected data transferred to and stored on 10x Genomics Cloud is encrypted using TLS in transit, encrypted at rest with AES-256, and are stored within the United States (US-WEST2 and US-EAST2 on AWS). Additionally, connections to Xenium Analyzer performance monitoring does not require opening any ingress ports in the user's firewall.

10x Genomics Cloud is subject to the 10x Genomics Cloud Service Terms, and data collected under this performance monitoring will be treated as Usage Data as defined under the Cloud Service Terms.

# Remote Support

Should an unexpected error occur with the Xenium Analyzer, 10x Genomics is committed to troubleshooting the problem as soon as possible. To enable this, a remote support feature allows a 10x Genomics representative to remotely access the instrument and observe the problem in real-time to find and implement an appropriate solution. The remote support option is completely user controlled and can be locally enabled or disabled by the user at any time by using the instrument settings menu.
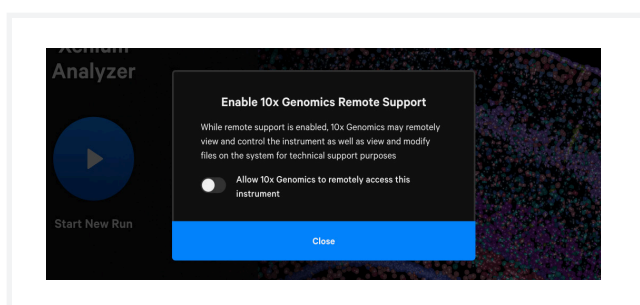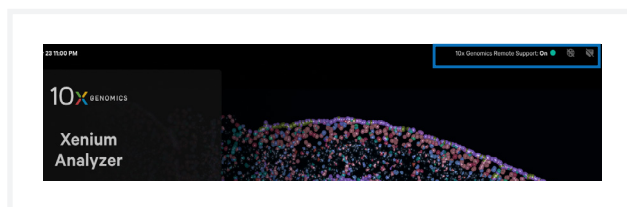


### Remote Support Protection

Remote support for the Xenium Analyzer is designed to keep the user network and the instrument safe. Remote support for the instrument does not require opening any ingress ports in the user's firewall and is conducted over an encrypted connection on a private network, protecting user data from third parties. The Xenium Analyzer employs a strong host firewall that blocks all inbound connections and is protected from attack on the local network and from the Internet. Outbound connections are made to trusted 10x resources only. In addition, access by 10x Genomics employees is restricted, with only the strictly necessary 10x personnel granted access upon customer support requests.

*Contd.*

**Access Permissions & Limitations**

Remote support enables a 10x representative to locally access the instrument (similar to onsite support). 10x representatives will not access or transfer any experimental data or sample images without the user's permission. Once the needed support has been provided, the user can disable remote support, which can also be re-enabled only by the user if needed at a later time. Additionally, a status icon in the Xenium Analyzer interface will always keep the user informed about the status of remote support (enabled or not) thereby empowering the user to control access.



# Additional Technical Details

**Outbound Connectivity**

To provide remote monitoring and remote support, Xenium solely requires outbound connectivity to 10x Genomics systems. No inbound ports need to be opened on your institution's firewall.

For remote support, 10x Genomics uses Tailscale, a modern, secure end-to-end encrypted tunnel built on Wireguard. For more information about Tailscale's security and compatibility with your network, refer to https://tailscale.com/security/ and https://tailscale.com/kb/1230/tailnet-lock-whitepaper/.

Given the outbound-only requirements, it is possible that Tailscale is already supported on your network. To confirm correct Tailscale operation, run the following command on your network:

```
$ tailscale netcheck
```

A successful Tailscale connection should produce a result similar to the one shown below:

```
$ tailscale netcheck
Report:
    * UDP: true
    * IPv4: yes, 64.125.32.42:61871
    * IPv6: no, but OS has support
    * MappingVariesByDestIP: true
    * HairPinning: false
    * PortMapping:
    * Nearest DERP: San Francisco
    * DERP latency:
            - nyc: 68.3ms   (New York City)
```

An unsuccessful Tailscale connection should produce a result similar to the one shown below:

```
$ tailscale netcheck
Report:
    * UDP: false
    * IPv4: (no addr found)
    * IPv6: no, unavailable in OS
    * MappingVariesByDestIP:
    * HairPinning:
    * PortMapping:
    * Nearest DERP: unknown (no response to latency probes)
```

*Contd.*

## Detailed Whitelisting of Hosts and Ports

Table 1 below lists the complete set of hosts, ports, and protocols in use by the Xenium Analyzer. It is highly recommended to use the DNS entries in your firewall rules instead of the IP addresses as the IP addresses may be updated from time to time.

Tailscale provides additional guidance on how the service operates at:
https://tailscale.com/kb/1082/firewall-ports/

## Local Connectivity

The Xenium Analyzer is designed to integrate into the customer's local network without the need for joining a specific local domain. It is also shipped as a complete software system without the option to install additional software or security solutions.

## Storage Requirements

For estimates on how much storage to prepare for a Xenium installation, please consult this page on the 10x Genomics Support website.

**Table 1.** Hosts, ports, and protocols in use by the Xenium Analyzer

| Application | Protocol | Source IP:Port | Destination IP:Port |
|---|---|---|---|
| 10x Telemetry | TCP | <Xenium IP>:* | envoy.10xgenomics.com:443 |
| 10x Logging | TCP | <Xenium IP>:* | device-log.10xgenomics.com:443 |
| Tailscale Login, Log and Control | TCP | <Xenium IP>:* | login.tailscale.com:443<br>controlplane.tailscale.com :443<br>log.tailscale.com:443<br>log.tailscale.io:443 |
| Tailscale DERP | UDP | <Xenium IP>:3478<br><Xenium IP>:41641 | derp1f.tailscale.com:*<br>derp1g.tailscale.com:*<br>derp1h.tailscale.com:* |
| Tailscale DERP | TCP | <Xenium IP>:* | derp1f.tailscale.com:443<br>derp1g.tailscale.com:443<br>derp1h.tailscale.com:443 |
| NTP | UDP | <Xenium IP>:123 | *:123 |

# Document Revision Summary

| | |
|---|---|
| **Document Number** | CG000645 |
| **Title** | Xenium Analyzer: Network Connectivity Guidelines |
| **Revision** | Rev A to Rev B |
| **Revision Date** | March 2023 |
| **Specific Changes** | Updated to include additional technical details regarding outbound connectivity, detailed whitelisting of hosts and port, local connectivity, and storage requirements. |
| **General Changes** | Updated for general minor consistency of language and terms throughout. |

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