

## INTRODUCTION

In distributed Structural Health Monitoring (SHM) systems, temporary interruptions in network connectivity are a common and expected occurrence. Routine operations such as network switch restarts, router reboots, Wi-Fi signal loss, or short Internet outages can disrupt the data stream between remote acquisition units and the central server. To ensure zero data loss, Digitex Systems developed the Store&Forward® mechanism – an intelligent buffering and recovery feature integrated into every xDAS family device. This functionality guarantees that structural vibration and environmental data are preserved locally during any communication failure and automatically forwarded once the connection is restored.

## CONFIGURATION

The Store&Forward® function can be enabled and adjusted directly from each device's embedded web interface, accessible via the device's IP address or thru Voyager application.

**Navigation Path:** *Configuration* → *General Settings* → *Stream Buffer* → *External RAM Buffer*

When enabled, the system uses a dedicated external hardware RAM module to temporarily store streaming data in real time. No additional configuration on the Voyager® side is required – the process is fully automated.

## BENEFITS FOR STRUCTURAL HEALTH MONITORING (SHM)

- **The Store&Forward®** feature delivers significant operational and data integrity benefits for SHM deployments:
- **Zero Data Loss:** Ensures uninterrupted data continuity even during network downtime.
- **Automatic Recovery:** No manual intervention required; the system self-detects reconnection and restores data flow.
- **Event Preservation:** Maintains the integrity of critical seismic or vibration events that occur during outages.
- **Operational Reliability:** Ideal for remote or harsh-environment installations where intermittent network access is common.
- **Regulatory and Research Confidence:** Guarantees data completeness for structural safety assessment, forensic analysis, and long-term monitoring archives.
- **Voyager Integration:** Seamlessly visualized in Voyager® with intuitive color status indicators (green = normal streaming, blue = running / forwarding mode).

## FUNCTIONAL DESCRIPTION

Once activated, the Store&Forward® mechanism continuously writes each second of acquired data into the device's internal **high-speed external RAM buffer**.

If a communication interruption occurs – for example:

- Network switch or router reboot,
- Ethernet cable disconnection,
- Temporary Wi-Fi signal loss (for xDAS Ambient family),
- Internet service interruption,

Then the device automatically detects the loss of connection and switches to **buffering mode**, where it continues local acquisition and storage without interruption.

As soon as the communication link is re-established, the device transitions into Running Mode, indicated by a **blue status indicator in the Voyager®** application. In this state, the xDAS device immediately begins forwarding all buffered data to Voyager®, ensuring chronological reconstruction of all records.

Once the backlog is completely transmitted, the device seamlessly returns to **Normal Streaming Mode**, indicated by the **green status indicator**.

The external RAM buffer provides enough capacity to store up to 1 hour of continuous data for a 3-channel device operating at 200 samples per second (SPS).

This capacity scales automatically based on the sampling rate and channel configuration.