

WAN Transfer Acceleration



Making the Most of Your Infrastructure

Solutions • Technology • Background



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Mission

Along with data intensive global workflows there is a growing demand for fast long haul data transmission.

Standard data transfer tools fail miserably – despite of today's 1 or 10 Gigabit Ethernet (GE) networks. Thus many companies are still shipping hard disks instead of sending data via available computer networks. Hence highly qualified personnel is doomed to wait and hardware resources cannot be utilized.



TIXEL's goal is to overcome this inefficient treatment of costly resources.

Benefits

TIXEL offers highest transfer speeds and fastest replication of huge amounts of bulk data. This allows significant acceleration of global workflows in manifold areas of application. Moreover TIXEL solutions are enabler for novel workflows which where impossible to implement so far.

- Enables global B2B inter-facility collaboration
- Optimizes usage of limited and expensive resources
- Dramatically decreases workflow process time

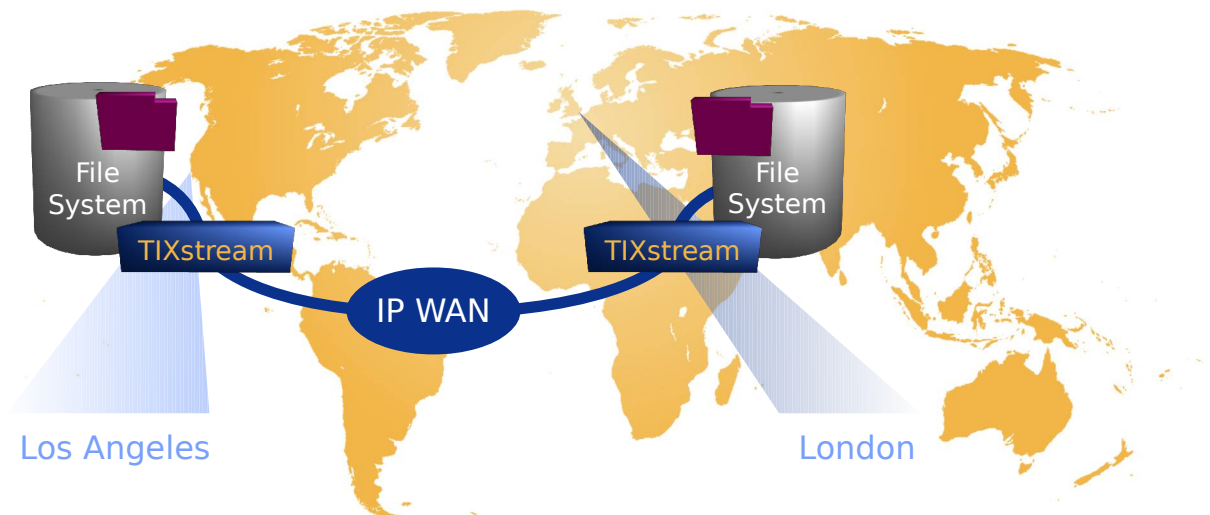
Solutions

Typical areas of applications are where massive amounts of data are moved between different locations for distributed workflows, e. g. in media industry and science.

Depending on the actual network configuration significant acceleration of data transfer times are achieved – an essential part of time critical global workflows.

TIXEL offers two solutions: while TIXstream enables ultimate transfer speed TIXway is focused on transparent acceleration of existing FTP-based workflows with ultimate ease of integration.

TIXstream



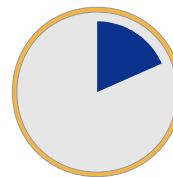
TIXEL's TIXstream Series provides highest speed grades for reliable data transmission in **Wide Area Networks** (WANs). TIXstream is the ultimate accelerator and enabler for global data intensive applications.

The Reliable WAN Transfer Protocol (RWTP) guarantees **100% error-free** data transfers at **fastest speeds** of up to 625 Megabytes per second (5 Gigabits per second) on standard Internet Protocol (IP) networks — even in case of packet loss, jitter, and high latencies.

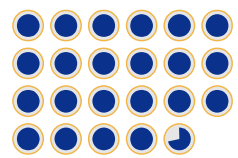
Transferring 400 Gigabytes from Los Angeles to London on a 10 Gigbit link may take 23 hours using the file transfer protocol (FTP). Or 11 minutes using TIXstream.

Strong **AES 256 encryption** is available without degradation of transfer speed.

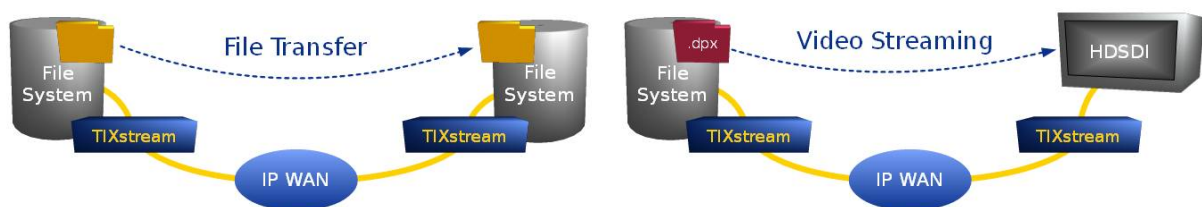
TIXstream



FTP

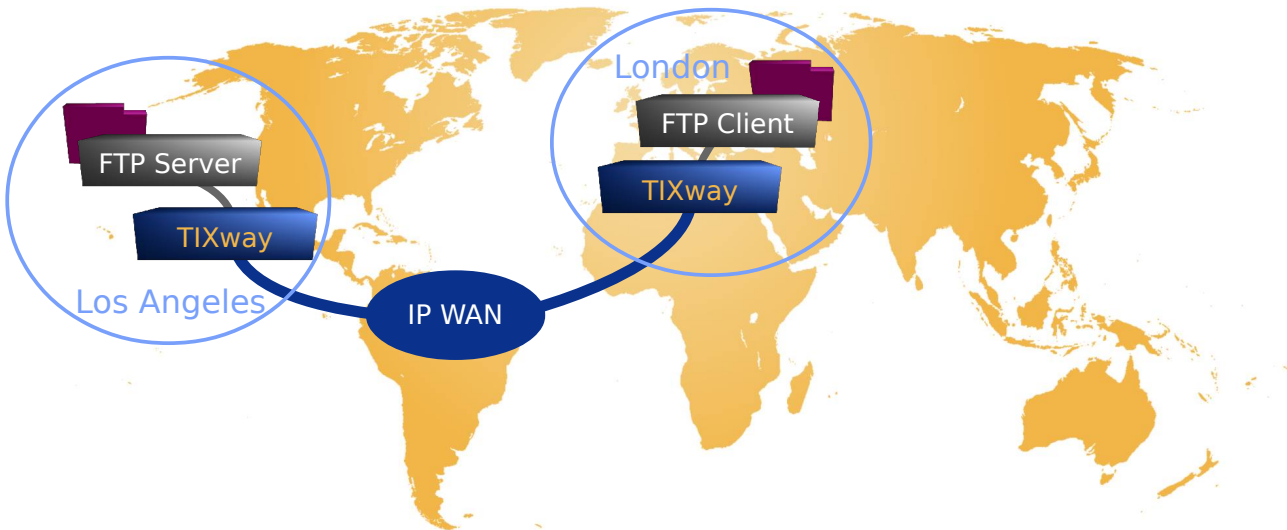


The TIXstream high performance software framework optimizes the entire end-to-end transfer chain including file system and network access as well as CPU intensive processing. For highest flexibility there are multiple ways of **seamless integration** of TIXstream in various kinds of environments.



Besides moving all kind of files for generic transfer, backups and synchronization TIXstream is also capable to remotely play out uncompressed SD, HD and 2K DPX files for movie and video production applications.

TIXway



Fast file transfer is the key enabler for distributed workflows and cloud services. Common File Transfer Protocol (FTP) works well in local environments but its speed heavily degrades on today's multi-gigabit Wide Area Networks (WANs).

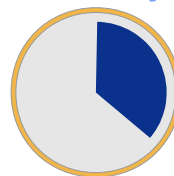
TIXway boosts FTP based workflows with **minimum user impact**: no extra software, no extra devices, no change in workflows.

TIXway provides significant **transfer acceleration** by replacing FTP on the critical long haul path and using TIXEL's patented Reliable WAN Transfer Protocol (RWTP) instead. This guarantees 100% error-free data transfers at fastest speeds on standard Internet Protocol (IP) networks. Packet loss, jitter, and high latencies are efficiently compensated by RWTP.

Transferring 100 Gigabytes from Los Angeles to London may take 11.5 hours using plain FTP on a 1 Gigabit link. Or 22 minutes using TIXway.

TIXway can be deployed as an in-house solution for world wide operating organizations as well as a multi-tenant provider service for several customers.

TIXway



FTP



Key Features

TIXEL products for wide area network data transport offer a unique combination of compelling features.

- 100% reliable data transport
- Works on standard Internet Protocol (IP) networks
- Jitter and packet loss resistant
- Software only solution
- Based on commercial off-the-shelf hardware specified by TIXEL
- File transfer supports any data format

- Content-independent speed, low end-to-end delay – no compression

The following features apply to the TIXstream series.

- Peerless speed performance: up to 625 Megabytes per second (5 Gigabits per second) data transfers with TIXstream-F10
- Secure – data encryption without transfer speed degradation
- Unified solution for file-based and real-time AV-based data transport
- Wide range of connectivity options
- Very fast MD5 integrity verification (> 4 Gigabit per second)

TIXstream supports transport of any kind of files read and stored to disks as well as remote play-out of video images through an HD-SDI interface.

Technology

Why not using conventional Internet protocols?

Two basic protocols are available for data transfer: Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). Why not simply use them?

TCP is used in many applications for transferring files – like ftp or http.

- adapts sending rate to network conditions
- constantly tries to increase sending data rate
- slows down on timeouts
- TCP (even tweaked) fails on high-latency networks with jitter or packet loss

UDP was designed for low latency real-time audio and video applications e. g. IP telephony. UDP simply sends data packets without taking care about reception.

- connectionless (not reliable)
- even with FEC not resistant against bursty packet losses

Thus neither TCP nor UDP is capable of providing reliable high speed transfer in wide area networks. That is the reason why TIXstream makes use of its own patent-pending protocol called Reliable WAN Transfer Protocol (RWTP).

Performance results

Regarding measured values for a simulated WAN environment with a 10000 kilometers line (round trip time: 100 ms) and a packet loss rate of 0.1 %.

- UDP seems to provide high data rates but is not capable to recover lost packets – resulting in corrupted data.
- TCP acts reliable but delivers poor performance at 20 Megabits/second.
- RWTP however provides 4500 Megabits per second – maintaining both reliability and speed.

At a packet loss rate of 0.8 % TCP delivers only 5 Megabits/second while RWTP still provides 3600 Megabits/second.

Hence RWTP dramatically increases the utilization of high speed WAN connections. In combination with the TIXstream high performance framework these data rates are maintained throughout the entire input/output and processing chain.

Why are we faster than others?

A couple of technical details have to be combined in order to achieve TIXstream's performance.

Automatic repeat request (ARQ) principle

- Packet retransmissions
- Intelligent Acknowledgment (ACK), Negative ACK (NACK), and Selective ACK (SACK) management
- Exploitation of IP-network characteristics
 - Burstiness of loss patterns
 - Proactive reactions on network events
 - Avoid unnecessary time-outs

Novel flow control

- Heuristics on available buffer estimation
- Usage of second and third derivatives of increase/decrease rates

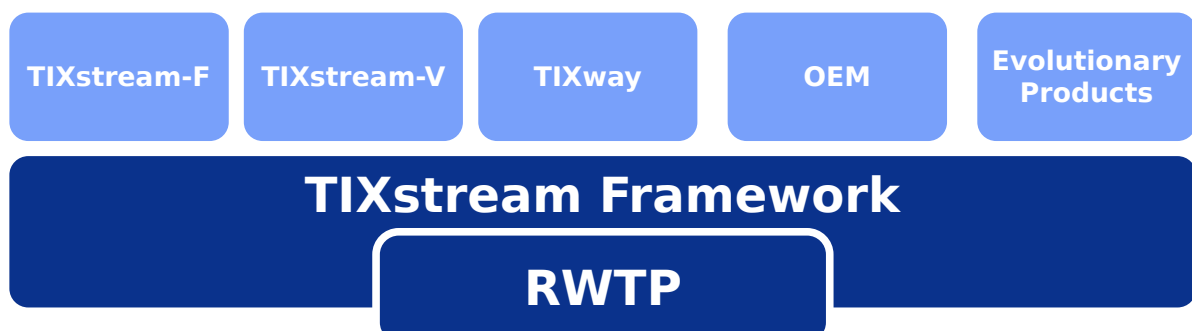
No data compression or deduplication

- Avoiding immanent delays
- Content-independent full transfer speed

Consequent exploitation of multi-core architectures

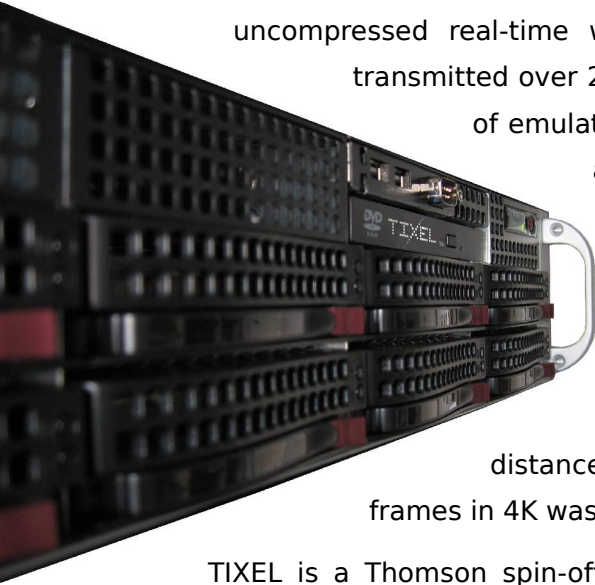
- Even core stack is multi-threaded
- Avoidance of synchronization means

It is important to point out that a transmission protocol itself cannot solve the overall issue - its implementation and embedding into a high-performance framework along with efficient I/O and processing routines are an essential key to end-to-end performance.



The TIXstream framework covers the whole chain from source to destination. Needless to say that this framework is the foundation of all current TIXstream products as well as for coming solutions.

About TIXEL



In November 2007 Thomson Technology successfully demonstrated the world's first 4K uncompressed real-time wide area transmission. The data was read from a SAN, transmitted over 2000 kilometers of a production network plus 8000 kilometers of emulated line with 0.1 % packet loss, and was finally presented with a 4K projector. While UDP unveiled each packet loss through a disrupted line in the displayed image, RWTP guaranteed a reliable transmission of each and every pixel for a 100% error-free presentation.

In December 2007 the technology went into production for connecting facilities in the L.A. area. Even in this medium distance scenario the time for transmitting a lab roll of 5000 DPX frames in 4K was reduced from 104 to 14 minutes.

TIXEL is a Thomson spin-off founded in 2009 continuing the work on high speed data transfers started in Thomson's network lab in 2005. Products derived from the developed technology are now available under the TIXstream umbrella. TIXstream significantly accelerates data-greedy distributed workflows. While the media and entertainment industry already benefits from them, TIXstream solutions add value to various general IT applications.

TIXstream technology is protected by more than 10 patent families filed in the U.S., Europe, and Asia. It is continuously improved by a highly experienced team. As a research and engineering driven company TIXEL works with a growing network of partners to develop and implement solutions for end users.

