**PRODUCT OVERVIEW**

**What is ZyPer4K?**

ZyPer4K supports distribution of ultra high-definition, uncompressed video, audio and other data signals using off-the-shelf 10Gb Ethernet switching technology, whereas the current ZeeVee product line uses coax for video distribution.

**What are the features of ZyPer4K?**

ZyPer4K’s features include the following:

- Uncompressed UltraHD (video, audio, and control using off-the-shelf (OTS) 10 Gigabit (Gb) Ethernet switches
- Versions for both HDMI1.4 and HDMI 2.0
- Support video up to 4k/60 4:4:4 including HDR (High Dynamic Range)
- Available in both Fiber and Copper versions
- Supports analog stereo and embedded digital audio channels (up to 7.1)
- 1GbE network utility port available on all encoders and decoders
- Source and display control (Infrared and RS232)
- ICRON ExtremeUSB® USB2.0 extension for KVM/HID and Mass Storage
- HDCP 2.0 and 2.2 compliant
- Video wall support for up to 5x5 displays
- API for system control/monitoring using either ZeeVee management platform or 3rd party control systems or applications (AMX, Crestron, iOS, Android).
- ZyPer4K can also be used in a point-to-point configuration to encode a 4K video source across a dedicated fiber connection to a display up to 30km away.

**When will ZyPer4K products be available?**

ZyPer4K HDMI1.4 and HDMI 2.0 Fiber and Copper products are currently shipping.

**Who or what is the target market?**

Target markets for ZyPer4K include facilities or campuses that have the need to switch multiple digital sources (e.g. digital signage players, set-top boxes, PCs/MACs, media players, cameras, video conferencing systems) throughout – using existing fiber infrastructure – to multiple discrete displays (including flat panels, projectors, video walls).

ZyPer4K is especially attractive for applications where some combination of UltraHD video, zero frame latency and pixel for pixel video reproduction is essential.

Please refer to this chart for a more detailed display of target markets:

<table>
<thead>
<tr>
<th>VERTICAL MARKETS</th>
<th>Government</th>
<th>Education</th>
<th>Healthcare</th>
<th>MDU</th>
<th>Corporate</th>
<th>Stadiums</th>
<th>Worship</th>
<th>Transportation</th>
<th>Entertainment</th>
<th>Hospitality</th>
<th>Retail</th>
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<tbody>
<tr>
<td>Café/Bar/Restaurant Video Distribution</td>
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<td>Guest/Patient Room Entertainment</td>
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<td>HealthClubs/Gyms</td>
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<td>Public Information Displays</td>
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<tr>
<td>Simulation Centers</td>
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<td>Video Walls</td>
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What are the target applications where ZyPer4K can be used effectively?

ZyPer4K can effectively distribute any number of source devices to any number of displays. Example applications include:
- Digital signage content distribution for Public Information Displays, Way-finding or advertising (including large-format touchscreen applications)
- High-end graphics with no latency in Visualization and Simulation environments (e.g. Oil and Gas strata recognition)
- Command and control environments
- CAD/CAM and graphic design studios
- In-room guest/patient entertainment systems
- Broadcast facilities
- Live event video distribution (stadiums, concert halls)
- Commercial facilities for digital signage distribution and Conference/Meeting room AV interconnects

What are the key benefits of ZyPer4K over existing solutions?

The benefits of ZyPer4K over other solutions are many:
- Uses 10Gb Ethernet switches to distribute uncompressed UltraHD (4K/30) video, audio, and control. ZyPer4K allows you to use almost any off-the-shelf 10Gb Ethernet switch to encode data, whereas other solutions use complex and expensive proprietary switches.
- Offers infinitely scalable and flexible input-output options without limitations. For example, use a 24 port Network Switch in any input-output configuration that fits the situation – for example, 1x23, 8x18, 4x20 and so on.
- Provides secure, AES128 bit encryption.
- Lets you perform installations quickly and easily with its simple “plug-and-play” approach. This approach allows for rapid and cost-effective deployment.
- Offers considerable cost-savings with its scalable, flexible, and easy-to-use features.
- Offers ability for use in a point-to-point configuration to encode a 4K video source across a dedicated fiber connection to a display up to 30km away.

How does ZyPer4K support?

ZyPer4K offers a model that supports KVM applications using USB2.0 connected devices. To achieve this, we utilize ExtremeUSB® technology from ICRON.

Does ZyPer4K support Independent signal routing?

Yes, Independent signal routing allows you to route video from one source to a display, and then perhaps route audio to that display from a different source. An example when this may be important is when you have a separate audio distribution system and need to send audio only to that system.

Does ZyPer4K support KVM (Keyboard, Video, Mouse) applications?

Yes. ZyPer4K does offer models that support KVM applications using USB2.0 connected devices. To achieve this, we utilize ExtremeUSB® technology from ICRON.

What about supporting other HID peripherals?

Yes. Any USB2.0 or lower HID peripheral can connect into our USB enabled encoders and decoders.

How does the video wall feature work?

ZyPer4K allows you to stretch a single source across any wall of monitors (n x m – an array of n monitors wide by m monitors high) without the need for any additional, costly hardware or software. Each display in the video wall receives a cropped portion of the original source and does allow for bezel compensation (if required). Maximum supported wall size is 6x6.

How does the Multi-view feature work?

ZyPer4K supports multi-view/compositing capability that allows a user to create a well-defined content distribution from a single display. e.g. Picture in Picture, Quad-View, L-Wrap 6 segment.

How much bandwidth does ZyPer4K need to send 1080p and UltraHD (4k/30) video?

Yes. ZyPer4K supports seamless switching between similar resolution sources and also synchronous displays while you switch inputs.

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How does ZyPer4K maintain HDCP Key management through secure key negotiation at both source and display?

ZyPer4K maintains HDCP Key management through secure key negotiation at both source and display and the use of 128-bit AES encryption on packetized Ethernet data between all sources and displays.

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Independent routing also becomes important with control signals that you need to send separately to different displays or different sources, or with USB Signals that you need to send separately.

How does ZyPer4K really allow you to use almost any off-the-shelf 10Gb Ethernet switch to encode data, whereas other solutions use complex and expensive proprietary switches.

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**FAQ**

**ZyPer4K**

- ZyPer4K distributes and displays sources at their native resolutions. Currently we provide an automated down-scale on our decoders from 4k/30 to 1080p/30 – which allows you to display 4k/30 sources on existing 1080p monitors. For all other up and down-scaling, the scaler’s built into most displays today perform adequately.

**AUDIO**

- **Does ZyPer4K support analog audio distribution?** Yes. Sources which provide analog audio can be connected into ZyPer4K encoders and distributed throughout the system.

- **Can Audio signals be routed independently?** Yes. Audio and Video signals can be routed independently but typically audio embedded into an HDMI signal is routed along with its video. We can however embed analog audio from a source into the HDMI output on a decoder.

- **Can ZyPer4K Embed and De-Embed Audio?** Yes. Analog audio inserted into any ZyPer4K encoder can be combined/inserted at its destination (ZyPer4K decoder) into the outbound HDMI signal. Also, the embedded digital audio on an HDMI signal can be de-embedded at its destination (ZyPer4K decoder) and sent to either the HDMI connector, the analog audio connector, or both (if the original signal is not encrypted, e.g. not Dolby Digital).

- **Can ZyPer4K manage encrypted audio, e.g. Dolby Digital?** Yes. To successfully route encrypted digital audio, routes should be made in genlocked mode only (currently).

- **Does ZyPer4K support a multi-channel down-mix?** Yes. If the audio source provides unencrypted multi-channel audio (e.g. LPCM), the ZyPer4K encoder can be embedded and down-mixed this audio stream to a 2 channel stereo signal, that can be routed independently to any decoder on the network.

- **Does ZyPer4K support audio extraction at the source (encoder)?** Yes. The ZyPer4K encoder can extract audio from its connected source OUT to the on-board analog audio connector. This extracted audio can be either the original 2 channel analog stream OR a 2 channel down-mix of an unencrypted multi-channel digital stream.

**CONTROL**

- **How do you control which sources are displayed on which destination displays?** ZyPer4K comes with the ZyPer Management Platform. This platform provides a fully functional HTML5 GUI that gives users the ability to switch sources, route signals independently and setup video walls and display groups/zones.

- **Does ZyPer4K support external control systems?** Yes. The ZyPer Management Platform is a self-contained LINUX appliance that hosts the API and supports both Telnet and AJAX/JSON connections for 3rd party control systems/programs. This appliance also serves up the GUI for system configuration and simple AV routing.

- **Will ZyPer4K allow me to control source devices and displays?** Yes. Since the ZyPer4K encoder and decoder units provide connectivity for Infra-Red controllers and emitters, we can support control of source devices and control displays (Power On/Off, Input selection) from either the central management platform or from an external control system e.g. touch panel.

**NETWORKING**

- **What network switches will ZyPer4K work with?** ZyPer4K should work with any 10Gb Ethernet switch that supports Multicast and IGMP snooping. IGMP snooping allows a switch to forward only multicast traffic between encoder and decoders that have requested it. Users who require seamless switching will need a 10Gb switch that also supports fast-leave/leave.

- **Do you have a list of approved switches that ZyPer4K has been tested against already?** Yes. We have performed testing against a variety of 10Gb switches from Netgear, Arista, Dell, Cisco, Extreme Networks, HP and ZyXel. Specific model information can be made available upon request.

- **Do 10Gb switches have enough bandwidth for typical video applications?** Yes. 10Gb switches that operate at line rate speeds provide enough bandwidth on the backbone for 10Gb duplex (i.e. in both directions simultaneously) for all ports. So a 24 port switch has 24x10x2 = 480Gbs of bandwidth on the backbone which can easily deal with a fully loaded video system.

- **Can you add ZyPer4K to an existing system?** Yes, it’s very easy. As long as there is an existing 10Gb Ethernet switch and IGMP snooping is enabled, it’s as simple as plugging ZyPer4K units into an available port and using the management software to auto-detect and route signals. Users may choose to segment traffic using VLANs or create a separate network for video distribution only.

- **Is a ZyPer4K system secure?** Yes. Security is extremely important to our clients. Our first product offering in the ZyPer4K family used fiber for all signal transport. The higher speeds available over fiber and the optical nature of the transport make data interception much harder. Optical fiber is not susceptible to the same issues of data leaks via electromagnetic fields as copper.

- **Does ZyPer4K encode data using Multicast, Broadcast, or Unicast?** Yes. This is a very important aspect of the ZyPer4K architecture. If a customer already has a 10Gb infrastructure, ZyPer4K can immediately connect into it and start encoding and switching signals. Since the data is encoded into standard Ethernet packets, there is no interference with other Ethernet equipment residing on the same network, such as desktops, laptops, phones, etc. As long as there is enough bandwidth on the network switch and the network hardware supports IGMP, ZyPer4K will work.

- **How much network bandwidth does ZyPer4K require?** ZyPer4K encodes video, audio, and control signals; in addition to any additional network traffic from devices connected to the encoder or decoder 1 Gb Ethernet ports. When we talk about bandwidth we typically focus on video bandwidth. Here are the bandwidths needed:

  - **Encoding 1080p/60fps video requires approximately 3.25 Gbps (Gigabits per second).**
  - **Encoding UltraHD (4k/30 4:4:4 or 4k/60 4:2:0) requires approximately 6.5 Gbps.**

  Note: 4k/6 4:4:4 signals require approximately 13.0 Gbps which can be lightly compressed with no visual loss to be capable of transmission on a 10Gb link.

- **How much latency can I expect from Source to Destination on a standalone/dedicated 10Gb network?** You can expect a latency of less than 50ms (milliseconds). When seamless switching is disabled (i.e. framebuffer is disabled), latency is reduced even further to less than 100μs (microseconds).

- **How does a Network administrator manage the ZyPer4K devices?** All ZyPer4K devices are auto-discoverable via their internal broadcast feature. Common network management tools will be able to recognize, add, and manage these devices as they would with any other Ethernet based equipment. Our ZyPer4K Management Platform provides a graphical interface to allow users to manage the encoder and decoder units, control protocols, scheduling, and signal routing (and presets).

- **How might you use the 1Gb Ethernet ports on the ZyPer4K encoder and ZyPer4K decoder?** Every ZyPer4K encoder and decoder provides a fully functional 1Gb Ethernet port for use by any standard Ethernet equipment. This configuration means you don’t have to run multiple cables to a source or display. You can connect a variety of devices into this port, including Wireless Access Points (WAPs), VOIP telephones, VTCs (Video Teleconferencing Codec) and SMART TVs/Displays.

- **Does ZyPer4K support POE?** ZyPer4K does not support POE.

**CABLING**

- **What cabling does ZyPer4K use?** ZyPer4K currently support both fiber and copper cabling for its 10Gb transmission rates. 10Gb Network switches are said to support SFP+ (10Gb Fiber) and/or 10GBaseT (10Gb copper).
ZyPer4K can use either single-mode or multi-mode cables.

ZyPer4K cannot use simplex (uni-directional) or duplex (bi-directional) fiber cabling. ZyPer4K requires use of full-duplex fiber cabling because it encodes over 10Gb Ethernet (gigabit Ethernet is a full-duplex transport system).

Fiber cable properties determine distances, but in general 50/125 multi-mode fiber (MMF) can encode up to 300m, and 9/125 single-mode fiber (SMF) up to 30km. 10 Gigabit Ethernet typically requires at least Cat6a cabling to achieve 100m distances, but other cable types can be used (with reduced distance limitations).

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>10GBase-T</th>
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<tbody>
<tr>
<td>Cat5</td>
<td>Not Supported</td>
</tr>
<tr>
<td>Cat5e</td>
<td>55m (180 ft)</td>
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<tr>
<td>Cat5 STP</td>
<td>100m (330ft)</td>
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<tr>
<td>Cat6 UTP</td>
<td>100m (330ft)</td>
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<tr>
<td>Cat6a UTP</td>
<td>100m (330ft)</td>
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<tr>
<td>Cat7</td>
<td>100m (330ft)</td>
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</tbody>
</table>

Yes, you can use many different fiber cabling types together in one installation, e.g. some connections over SM fiber, some over MM fiber, and some over UTP.

Yes, ZyPer4K uses both. OM3 and OM4 are both 50/125 core fiber but the difference between OM3 and OM4 fiber is bandwidth (2.560 megahertz vs. 4.700 megahertz), which in this case has limited impact on the distance that the signal can be encoded.

Yes, ZyPer4K provides the same excellent customer technical support as our other ZeeVee products.

The ZyPer4K encoder and decoder units each ship with the unit itself, a power supply, and a Quick Start Guide.

You can install ZyPer4K modules in our custom Z4KRack (19” rackmount enclosure housing up to 8 devices), on a shelf or using our custom L-Brackets on the wall, mounted behind a display or projector or in any place where it fits securely.

ZeeVee warranties ZyPer4K against defects in materials and workmanship for a period of three years from the date of purchase. For detailed warranty information, please refer to the warranty contained in the product’s user manual or look on the website under Warranty Registration.

Contact us to discuss your needs and schedule a demonstration or evaluation system.

Email us at sales@zeeve.com or call at North America Sales +1 (347) 851-7364 ; EMEA Sales +44 1494 896077 ; International Sales +1 (347) 851-7364.

ZyPer4K distributes HDMI sources connected into an off-the-shelf 10Gb Ethernet switch to an almost infinite number of displays using either single-mode or multi-mode fiber.

ZyPer4K also supports point-to-point installations where a single source is extended over fiber to a single display.

ZyPer4K Encoder ZyPer4K Decoder

HDMI
USB2.0
Audio Embed
Audio Extract
RS-232
Hybrid 10 GigaBit Ethernet
CatX or Fiber Connection

Point to Point

Cabling: either Cat6/7a or Fiber (Single-Mode/Multi-Mode)

Digital Signage
HD Cable/Satellite Box
Laptop
Blu-Ray Player
PTZ Camera
HDMI
USB2.0
RS-232
1Gb Ethernet
HDMI
De-embed Speakers
Keyboard
Touchscreen
HDTV
Smart TV
Mouse
Remote

ZeeVee products include the following:

Digital Signage
Audio Embed
USB2.0
RS-232
1Gb Ethernet
HDMI
De-embed Speakers
Keyboard
Touchscreen
HDTV
Smart TV
Mouse
Remote
Here you will find some common industry terms and their definitions. You may consider these terms helpful as you learn about, design and configure ZyPer4K. These definitions were taken from Wikipedia and edited somewhat for glossary purposes.

**10Gb Ethernet** – 10 Gigabit Ethernet (10GE, 10GBe, or 10 GigE) is a group of computer networking technologies for encoding Ethernet frames at a rate of 10 gigabits per second (10x109 or 10 billion bits per second). 10GBe can use either copper or fiber cabling. However, because of its higher bandwidth requirements, higher-grade copper cables are required.

**AutoIP** – This is a method of automatically assigning IP addresses to networked computers and printers.

**Broadcast** – Broadcast refers to encoding communication that will be decoded by every device on the network. The scope of the broadcast is limited to a broadcast domain. Broadcast a message is in contrast to unicast addressing in which a host sends datagrams to another single host identified by a unique IP address.

**Cat6a UTP** – Category 6 cable (Cat 6), is a standardized cable for Gigabit Ethernet and other network physical layers that is backward compatible with the Category 5/5e and Category 3 cable standards. Category 6a is defined at frequencies up to 500 MHz—twice that of Cat 6. Category 6a performs at improved specifications, in particular in the area of alien crosstalk as compared to Cat 6 UTP (unshielded twisted pair), which exhibited high alien noise in high frequencies. There are two types of Cat6A cable, unshielded (UTP) and shielded (F/UTP). F/ UTP denotes foiled/unshielded twisted pair and consists of four unshielded twisted pairs encased in an overall foil shield.

**CEC** – The CEC (Consumer Electronics Control) capability allows HDMI devices to control each other when necessary and allows the user to operate multiple devices with one remote control handset.

**DHCP** – Dynamic Host Configuration Protocol (DHCP) is a standardized network protocol used on Internet Protocol (IP) networks for dynamically distributing network configuration parameters, such as IP addresses for interfaces and services. With DHCP, computers request IP addresses and networking parameters automatically from a DHCP server, reducing the need for a network administrator or a user to configure these settings manually.

**EDID** – Extended display identification data (EDID) is a data structure provided by a digital display to describe its capabilities to a video source (e.g. graphics card or set top box).

**HDCP** – High-bandwidth Digital Content Protection (HDCP) is a type of digital content protection developed to prevent copying of digital audio and video content as it travels across connections.

**HID** – HID (Human Interface Device) is a type of computer device that interacts directly with, takes input from, and may deliver output to humans.

**HDMI** – High-Definition Multimedia Interface (HDMI) is a proprietary audio/video interface for transferring uncompressed video data and compressed or uncompressed digital audio data from an HDMI-compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio. HDMI is a digital replacement for existing analog video standards.

**IGMP** – The Internet Group Management Protocol (IGMP) is a communications protocol used by hosts and adjacent routers on IP networks to establish multicast group memberships. IGMP can be used for one-to-many networking applications such as online streaming video and gaming and allows more efficient use of resources when supporting these types of applications. IGMP operates between the client computer and a local multicast router.

**KVM** – A KVM (Keyboard, Video, Mouse) switch is a hardware device that allows a user to control multiple computers from one or more sets of keyboards, video monitors, and mice.

**Multicast** – Multicast (one-to-many or many-to-many) distribution is group communication where information is addressed to a group of destination computers simultaneously.

**Multi-mode fiber** – Multi-mode optical fiber is mostly used for communication over short distances, such as within a building or on a campus. Typical multimode links have data rates of 10 Mbit/s to 10 Gbit/s over link lengths of up to 600 meters (2000 feet) — more than sufficient for the majority of premises applications.

**POE** – Power over Ethernet or PoE describes any of several standardized or ad-hoc systems that pass electrical power along with data on Ethernet cabling. This allows a single cable to provide both data connection and electrical power to devices such as wireless access points or IP cameras. PoE allows long cable lengths. Power may be carried on the same conductors as the data, or it may be carried on dedicated conductors in the same cable.

**Single-mode fiber** – A single-mode optical fiber (SMF) is an optical fiber designed to carry light only directly down the fiber — the transverse mode. These modes define the way the wave travels through space, i.e. how the wave is distributed in space. Waves can have the same mode but have different frequencies. This is the case in single-mode fibers, where we can have waves with different frequencies, but of the same mode, which means that they are distributed in space in the same way, and that gives us a single ray of light.

**SFP Modules** – The small form-factor pluggable (SFP) is a compact, hot-pluggable transceiver used for both telecommunication and data communications applications. SFP transceivers are available with a variety of encoder and decoder types, allowing users to select the appropriate transceiver for each link to provide the required optical reach over the available optical fiber type (e.g. single-mode fiber or multi-mode fiber).

**UltraHD** – Ultra-high-definition television (also known as Super Hi-Vision, Ultra HD television, UltraHD, UHDTV, or UHD) includes 4K UHD (2160p) and 8K UHD (4320p), which are two digital video formats. “Ultra High Definition” or “Ultra HD is used for displays that have an aspect ratio of at least 16:9 and at least one digital input capable of carrying and presenting native video at a minimum resolution of 3840 × 2160 pixels.

**Unicast** – Unicast distribution is used for all network processes in which a private or unique resource is requested.