Pioneer of the Optical Ethernet Solution

Simplified Optical Ethernet Solution

About Ruijie

Highly Recognized in Education Industry

Servicing Education Industry for 20+ Years

Covering **2,600+** (100% Top 100) Higher Education Ingtitution in China

Covering **50.000+** primary.secondary,vocational schools

No.1 — WLAN market share in China Education industry (Source: IDC2022 Q3)

No.1 — Switch market share in China Education industry (Source: IDC222 Q3)

No.1 — In the market share of cloud classroom solutions in China for 7 years (Data source: CCW 2014-2020)

Solution Highlights

Provide customers with the Simplified Optical Ethernet (SOE) Solution that integrates advanced optical and Ethernet technologies and supports unified authentication.

1

All-optical architecture
all-optical connection, ultra-high-bandwidth

2

Simplified authentication
unified authentication, policy migration

3

Integrated O&M
all-in-one O&M and management of wired and wireless networks

Lightning Fast and Future-Ready, Innovative in Education

Industry Status and Challenges

As-Is Analysis

■ **Future Education Trends**

Dormitory

Smart Classroom

Stadium

Classroom

Outdoor Area

Office

|	
Fully Connected ■ Wireless coverage in all campus scenarios ■ Seamless roaming & ubiquitous access ■ Superior learning & user experience	**Smart Education** ■ Hybrid/Multimedia learning, AR/VR, AI, IoT ■ Campus applications & cloud services
Highly Scalable ■ Simplified and solid architecture ■ Future-proof network foundation	**Simplified Operation** ■ Intelligent automated operation ■ Efficient management ■ Innovative security

■ **Challenges**

Complex Scenarios & Poor Performance

- Too many devices from different vendors
- Complicated scenarios with poor network performance
- Limited bandwidth

Frequent Network Security Issues

- Lack of secure access to Intranet
- Unauthorized access
- Difficult authorization
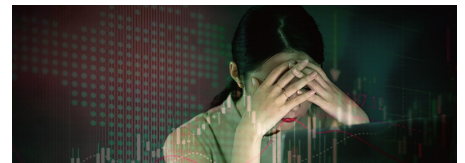
Difficult O&M

- Difficult troubleshooting
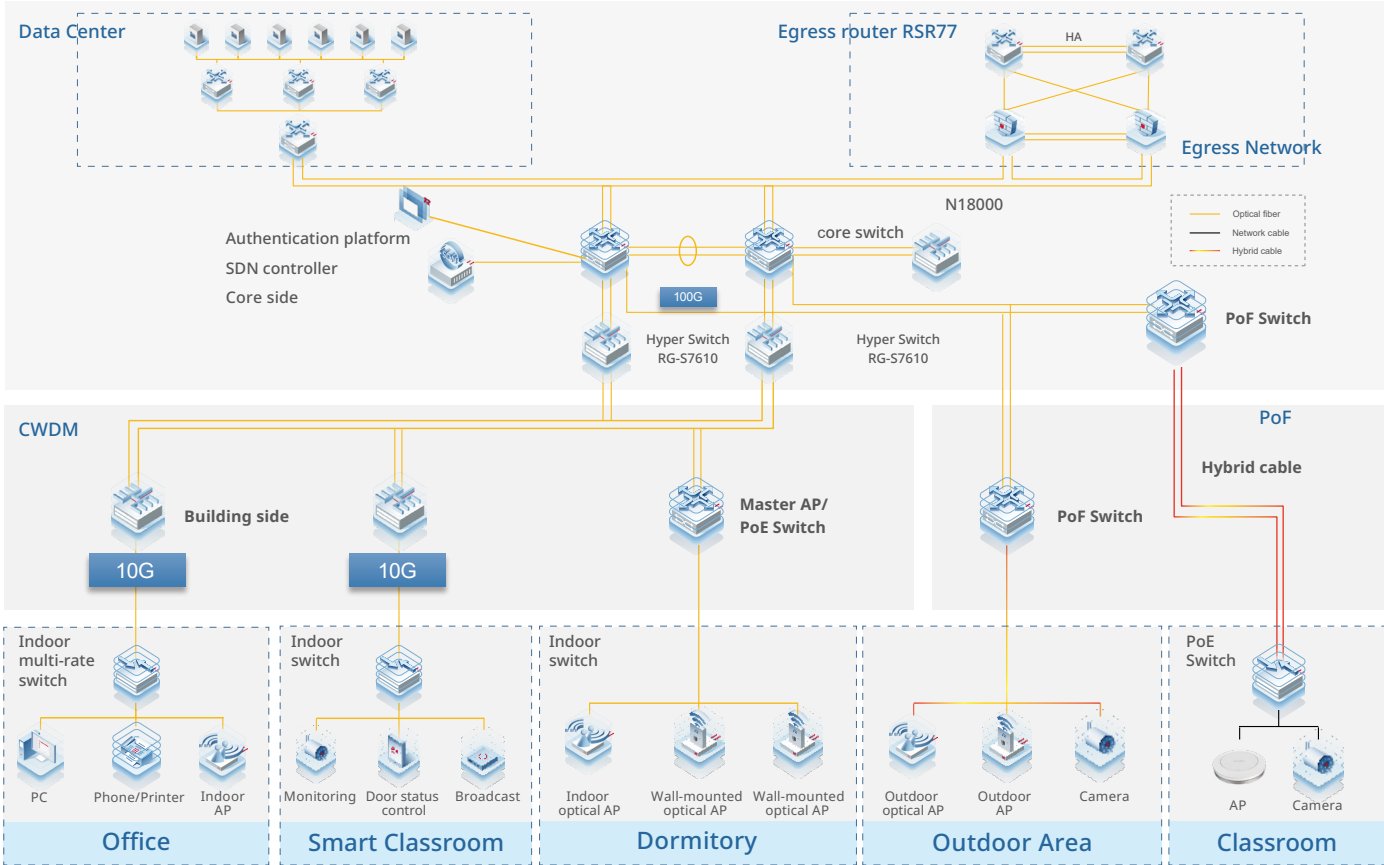- Difficult fault handling
- Lack of O&M personnel

Solution Overview

Solution Overview

Ruijie Simplified Optical Ethernet (SOE) Solution uses a new type of optical cable to connect Wi-Fi access points (APs) and extends the cables to each room for high-speed data transmission and long-distance point-to-point power supply.

Solution Architecture Design

Data Center			Egress router RSR77			HA	

Authentication platform
SDN controller
Core side

Egress Network

N18000

core switch

Optical fiber
Network cable
Hybrid cable

100G

Hyper Switch
RG-S7610

Hyper Switch
RG-S7610

PoF Switch

CWDM

PoF

Hybrid cable

Building side

Master AP/
PoE Switch

PoF Switch

10G   10G

Indoor multi-rate switch	Indoor switch	Indoor switch		PoE Switch
PC Phone/Printer Indoor AP	Monitoring Door status control Broadcast	Indoor optical AP Wall-mounted optical AP Wall-mounted optical AP	Outdoor optical AP Outdoor AP Camera	AP Camera
Office	**Smart Classroom**	**Dormitory**	**Outdoor Area**	**Classroom**

Lower CAPEX
All-optical Ethernet Network
- All-optical access Flexibility and scalability Sufficient bandwidth

Less complaints
Simplified Management
- Unified management and control
- Intelligent fault detection
- AI-based network optimization

Higher customer satisfaction
All-optical Ethernet Network
- Visualized user experience
- One-stop service hall

Architecture Features

The SOE Solution adopts a large Layer 2 network structure and adds an SDN controller, which is deployed in the core equipment room. There are three main differences between an all-optical network and a traditional Ethernet:

All-optical links are used for interconnection between the core and access switches, providing 10G access bandwidth and meeting the high bandwidth requirements.

Access switches are deployed indoors instead of in ELV rooms. Passive transparent distribution devices are deployed to enable passive and maintenance-free ELV rooms on each floor. Users only need to manage core equipment rooms and end-user rooms, significantly improving the O&M and management efficiency.

In outdoor scenarios, hybrid cables are used to connect the PoF switch to the remote PoE switches, cameras, and APs for direct power supply. This can solve the problems of difficult power supply and unstable local power supply on the access side.

Authentication Features

■ **Authentication pain points:**

Frequent Security Issues

- Lack of authentication, only egress control, no access control
- Security measures available only for wireless networks, not for wired networks
- Permission not under control
- Shared visitor key without real-name authentication

Lack of Unified Authentication

- Inconsistent access and egresscontrol
- Inconsistent authentication on wired and wireless networks
- Lack of unified management of user permissions

Poor User Experience

- Lack of support for roaming
- Re-authentication issues
- Frequent re-direction to the portal
- Policy permissions not meeting requirements

High O&M Cost and Poor Compatibility

- Multiple campuses and complicated management
- Mixed client versions
- Poor compatibility of devices with different brands

■ **Benefits of Ruijie Authentication Solution**

Unified authentication, simplified deployment, and support for web/802.1X/MAC-based authentication, as well as support for self-registration and guest authorization, cater to the common application needs of college users while easing the workload for O&M personnel.

Refined Management	Superb Experience	Simplified Deployment	Ultra-fast Implementation
5-tuple-based policy control and management	**User experience:**	**Smart operation:**	
■ Permission policies based on identities	■ Integration of access and egress	■ Multi-campus implementation	■ Compatibility with third-party devices
■ Time- and place-based policies	■ Network-wide roaming with one authentication	■ Self-service user management	■ Hundreds of success cases
■ Access mode-based policies	■ MAB authentication	■ Scenario-based configuration	
■ Terminal-based policies	■ Unique noise reduction mechanism	■ Full lifecycle management of campus network account	

One Network – One Authentication

O&M Features

The proprietary INC-PRO platform supports zero-touch provisioning and replacement, topology discovery, alarm reporting, and other common O&M functions. It also allows unified O&M of third-party devices, simplifying O&M.

Scenarios and Benefits

Scenario 1: Smart Classroom

■ Pain points:

Traditional switches and enterprise-grade Optical Network Terminal (ONTs)

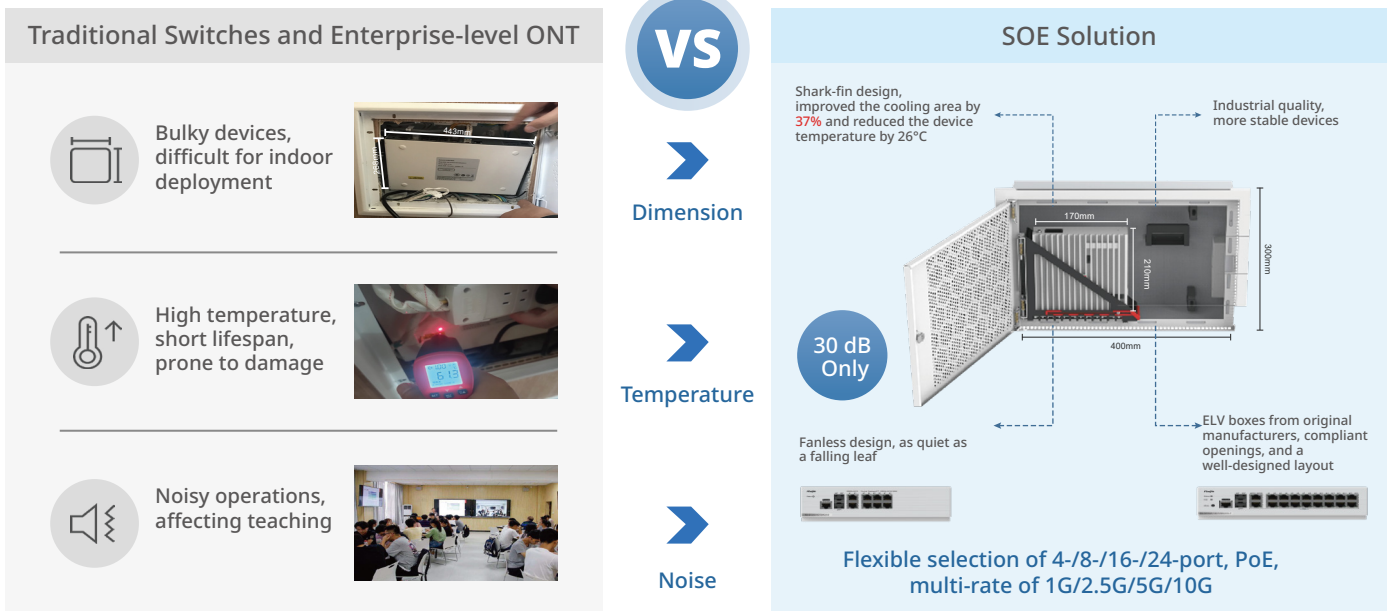| 01	Bulky devices, difficult for indoor deployment	02	High temperature, short lifespan, prone to damage	03	Noisy operation that affects teaching

Traditional Solution

Ruijie SOE Solution

VS
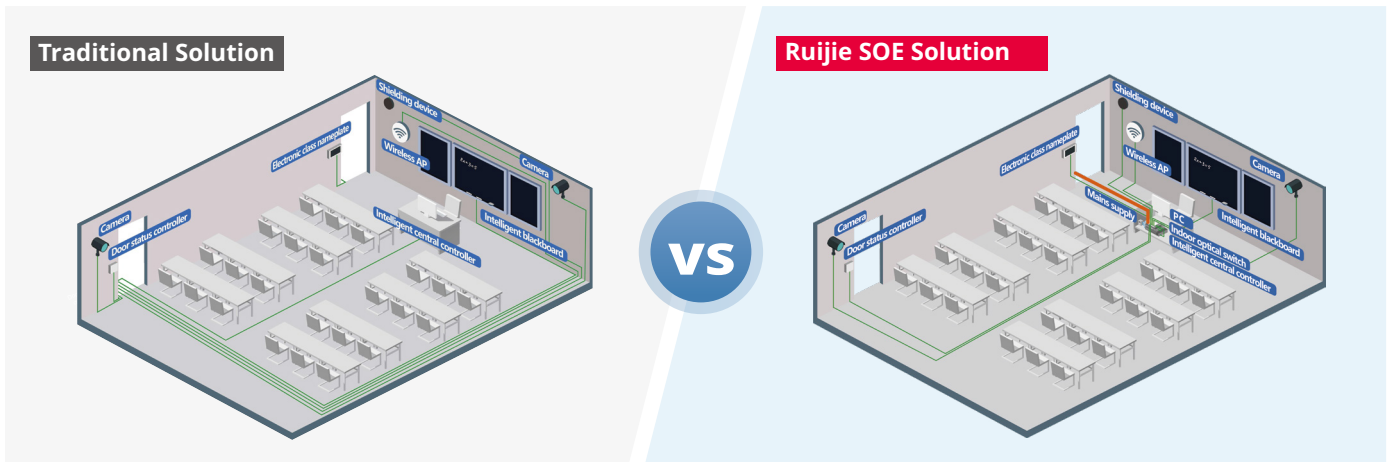
■ Solution Benefits:

Indoor optical PoE switches can alleviate the load on cable trays, facilitate rapid service provisioning, and deliver ultra-high bandwidth.

In multimedia classrooms, practice rooms, computer rooms, offices, and medium- and large-sized conference rooms, one or more 1G/10G uplink multi-port optical Ethernet switches can be deployed to achieve integration of wired and wireless networks and integrated access of multi-service subnet terminals. Multi-port optical Ethernet switches:

Traditional Switches and Enterprise-level ONT

VS

Bulky devices, difficult for indoor deployment

High temperature, short lifespan, prone to damage

Noisy operations, affecting teaching

Dimension

Temperature

Noise

SOE Solution

Shark-fin design, improved the cooling area by **37%** and reduced the device temperature by 26°C

Industrial quality, more stable devices

170mm

210mm

300mm

400mm

30 dB Only

Fanless design, as quiet as a falling leaf

ELV boxes from original manufacturers, compliant openings, and a well-designed layout

Flexible selection of 4-/8-/16-/24-port, PoE, multi-rate of 1G/2.5G/5G/10G

- Interconnect with the passive transparent distribution devices in the building (dedicated port for each room, symmetric uplink and downlink bandwidth).

- Connect to wired devices in the room through downlink 1G electrical ports.

- Supply power to indoor Wi-Fi 6 APs, high-density Wi-Fi 6 APs, or PoE cameras through the 1G/2.5G/5G PoE or PoE+ ports.

Scenario 2: Office

Indoor RG-SF2920 series switches can be deployed in large offices and wall-plate APs can be deployed in small offices to support both wired and wireless access.

■ Pain points:

- Administrative staff often face frequent relocations of workstations, resulting in unstable information points and sometimes even large-scale relocation. As a result, the number of ports is often insufficient. In this case, only unmanaged switches can be cascaded to expand the network. However, this may cause network instability due to loops.

- The manager's offices, usually located at the ends of each floor, are over 100 meters away from the ELV room, posing cabling challenges. These offices need straightforward, quick construction with indoor devices that seamlessly blend in, making frequent network device reconfiguration and cabling construction challenging.

- In addition to high bandwidth demands, data sharing within the office is also a key consideration. Teachers often need to use network neighbors for data sharing, printer sharing between rooms, and other services. As a result, the design and planning of the office network must allow for flexible division of service isolation and sharing.

Traditional Solution

Small office

Wireless AP

Wireless router

Wireless router

Information point

Configuration-free switches

Floor switch

Configuration-free switches

Large office

VS

SOE Solution

Wired and wireless integrated optical wall-plate AP

Small office

Mounted on the wall

Wireless AP

Installed on a desk
Desktop optical switch

Optical wall plate AP

All-optical/transparent distribution switch in a building

Desktop optical switch

Attached to a desk

In-room fiber optical switch

■ Solution Benefits:

Wi-Fi 6 wall-plate APs with uplink capabilities (featuring optical ports and CWDM transceivers) are installed in managers' offices, small offices, and small conference rooms. These APs are locally powered and connected to transparent distribution devices in buildings to enable seamless integration of wired and wireless deployment, ensuring comprehensive wireless coverage.

Optical micro APs (with four 1G downlink electrical ports and two 2.5G uplink optical ports) compatible with common optical transceiver modules are deployed in centralized office areas, student dormitories, staff apartments, affiliated hotels, and other similar environments. These APs are interconnected with the optical master AP and can be powered locally or through a hybrid cable. The optical master AP uses its uplink 10G interface to connect to the downlink optical ports of the all-optical Ethernet aggregation switch in the main building, realizing integrated wired and wireless deployment.
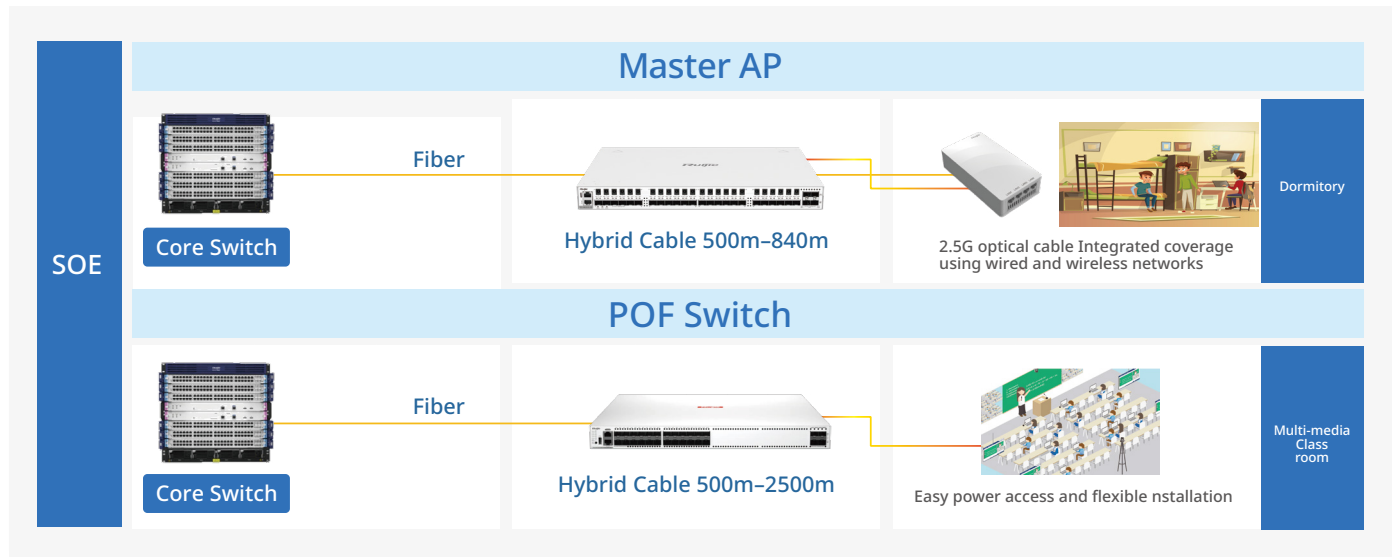
Topology of Scenario 3, Scenario 4, and Scenario 5

Note: To accommodate different application scenarios, the optical master AP and the PoF switch use different types of hybrid cables with varying supported distances.

Scenario 3: Dormitory
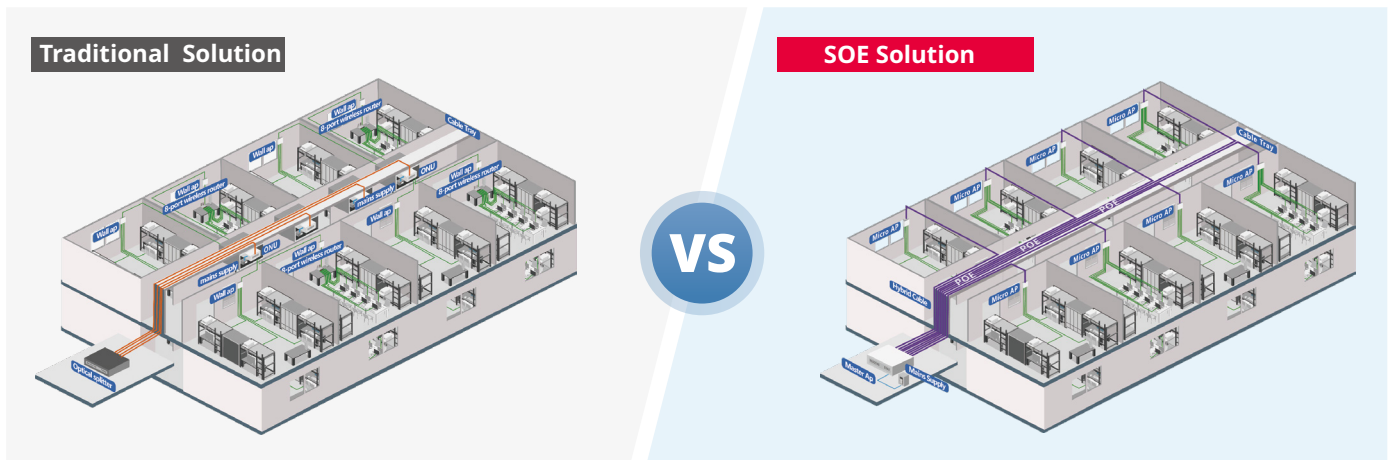
■ Pain points:

Dormitory environments are characterized by high user density, limited space, diverse types of devices, and a significant number of simultaneous connections, leading to considerable interference. Given that students have higher expectations for the network access quality and traffic, it is essential for dormitories to ensure full coverage and deliver a high-quality Internet access experience. As online activities and learning become increasingly common on dormitory networks, the demand for robust dormitory network is also increasing.

■ Solution Benefits:

In dormitory scenarios, we use the hybrid cable deployment method to overcome the limitations of traditional Ethernet cables, which can only supply power over a distance of 100 meters.

The hybrid cables in dormitories can support a maximum distance of over 800 meters, providing ultra-high bandwidth and excellent signal coverage.

Scenario 4: Unified Power Supply Management in Classrooms

Fixed PoF switch

Single-port PoE media conversion

Supports up to 24 PoE switches

Supports up to 2400 W power supply

Fixed PoF switch

4-port PoE switch

Classroom

	Optical Fiber
	Hybrid Cable
	Network Cable
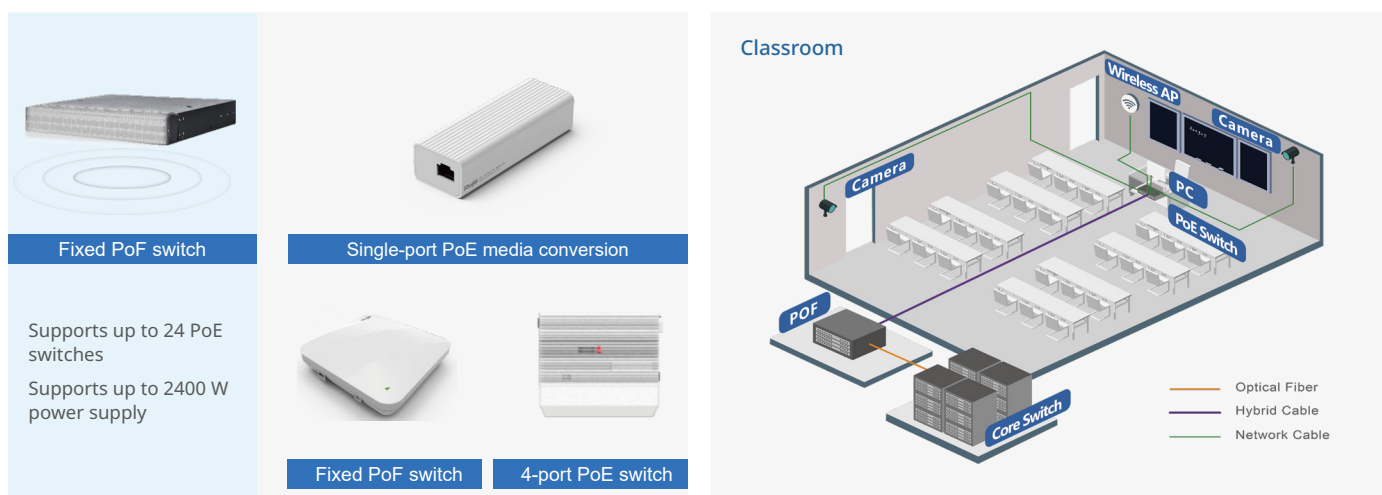
■ Pain points:

In old classrooms where power supply is lacking or insufficiently deployed, it becomes challenging for newly upgraded APs and cameras to access power, thereby hindering teaching activities.

■ Solution benefits:

The PoF switch directly supplies power to the PoE switch (4-port) through the hybrid cable, and the power supply can be managed and switched remotely on the backend. Unified management of power and data helps quickly locate faults and improve O&M efficiency.

Scenario 5: Outdoor Area

Traditional Sport Court

SOE Solution – All Optical Campus Sport Court

VS
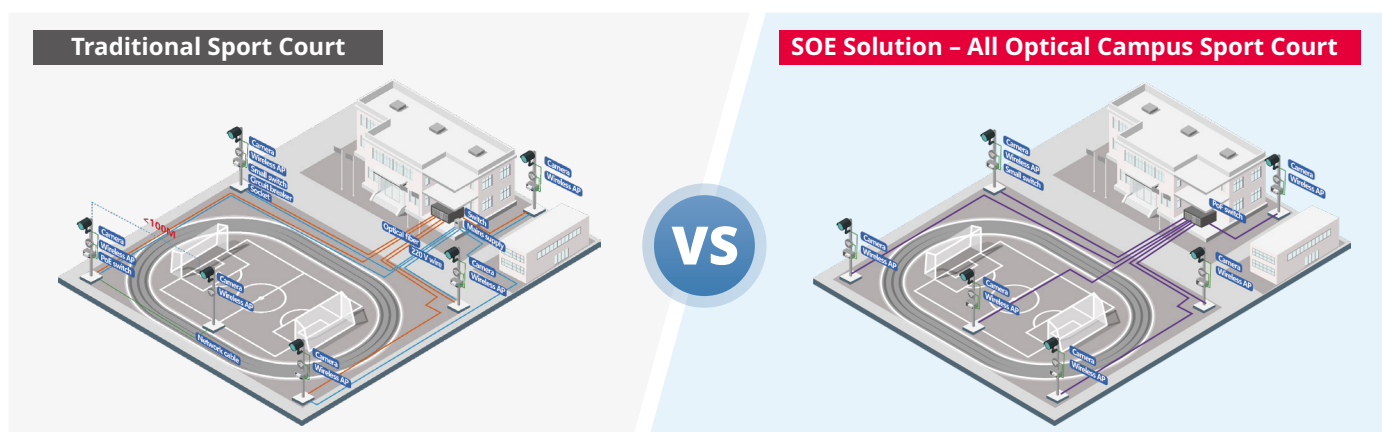
■ Pain points:

During AP deployment, traditional directional or omni-directional antennas are either exposed outdoors or buried underground. This causes many coverage holes. The installation and O&M of power cords and copper cables are difficult, and the cables have a short service life and safety risks. The exposed cables also impact the campus aesthetics.

■ Solution benefits:

PoF switches are installed indoors and connected through hybrid cables, which can provide power supply over a long distance of up to 2 km. Optical links provide high bandwidth, enabling simultaneous transmission of data and power.

Comprehensive product models provide full coverage, eliminating coverage holes.	Hybrid cables, with a neat appearance, support both data and power transmission.	All-optical connection enableshigh-speed access and high bandwidth.
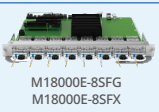
Products
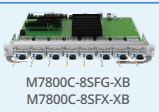
Switches

Core/AggregationSide

RG-N18K-E series	M18000E-8SFG / M18000E-8SFX	RG-S78Xseries	M7800C-8SFG-XB / M7800C-8SFX-XB

RG-S7620-20SFG2CQ / RG-S7620-20SFX2CQ

RG-S7610-10SFG2CQ / RG-S7610-10SFX2CQ

Transparent distribution Expansion module

RG-MUX-8LC/LC (2)
RG-MUX-EXT
RG-MUX-BOX

Optical Master

RG-S5750-24SFP4XS24DP-UP	RG-24DUP1DB48LC	RG-AM5528-SF	RG-HybridBox

Access Switches（PoE）

RG-SF2920U-4GT1MS-P	RG-SF2920U-8GT1MS-P	RG-SF2920-8GT2MG2XS-P	RG-SF2920-16GT2MG2XS-P	RG-SF2920-16GT2SFP-P	RG-PF2920-4GT1MS-P	RG-PF2920-DPBOX-P

Access Switches

RG-SF2920U-8GT1MS	RG-SF2920-8GT2MG2XS	RG-SF2920-16GT2MG2XS	RG-SF2920-16GT2SFP

Micro AP

RG-MAP852-SF-M	RG-MAP852-SF-S

Transceivers

Core side: SFX transceiver	Access Side: optical transceivers

WLAN Products

Wi-Fi 7

2024 Q1

RG-AP9861-R
Wi-Fi 7 Flagship

Indoor

RG-AP880-AR
AR Series Flagship

RG-AP880-E
Wi-Fi 6E High Density

RG-AP850-AR(V3)
AR Series-High Density

RG-AP840-I(V2)
Wi-Fi 6 4x4 Performance

RG-AP820-AR(V3)
AR Series Performance

RG-AP820-I
Performance

RG-AP810-I
Wi-Fi 6 Entry Level

Outdoor

RG-AP680-AR
AR Series Outdoor Flagship

RG-AP680-IO
Outdoor 4x4 Performance

RG-AP680-O(V3)
Outdoor Omni Cost Performance

RG-AP680-CD(V3)
Outdoor Directional Cost Performance

Wall-Plate

RG-AP180-I
Intelligent Panel Plus

RG-AP180(V3)
Intelligent Panel

Controller

RG-WS6512
High Performance AC
1152 AP Management

2024 Q1

RG-WS7110
Intelligent AC

RG-WS6008
Performance AC

AI Radio   Optical Fiber/Hybrid

Flexible Egress Interconnection

Flexible Egress Interconnection	
RG-RSR77-XA High availability	**RG-RSR20/30/50XA** RG-RSR20/30/50XA Flexible egress

Unified O&M & Simplified Authentication

Unified O&M		Simplified Authentication
INC-PRO Unified O&M, SDN	**RG-WIS** AI-based wireless network optimization	**RG-SAM+** Simplified authentication system

Success Cases

University Malaya
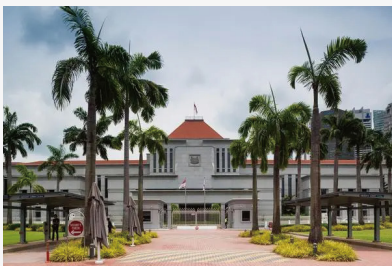
University Malaya

Wireless Campus Network in University Malaya

Customer Profile

Background: The University of Malaya (UM) is Malaysia's oldest and top-ranking institution of higher education. Currently ranked 70th globally and 8th in Asia, UM has a total enrollment of nearly 20,000 students. In 2022, UM began constructing an optical network to enhance the campus life experience for students and users, aiming to establish itself as a leading university campus.

Customer Pain Points

- Student Complaints： Low access speed, even disconnections, with 2 out of 10 students reporting poor experience.
- Coverage Holes： Only one AP in a corridor, insufficient coverage area with limited bandwidth.
- Difficult O&M： Massive devices generate heavy workload, no proactive problem warning.

Solution Value Delivery

POC results are highly recognized by the UM faculty, and they placed PO of the SOE solution at once, which is the first SOE solution in the international market.

Telkom U

Telkom University

Wireless Campus Network in Telkom-U

Customer Profile

Telkom University is the Best Private University in Indonesia. Telkom University focuses on ICT based education and research in the field of engineering, business, and creative industry.

Customer Pain Points

- The wireless coverage across the entire campus is poor, specifically in the dormitories where roof APs are used in corridors.
- The use of aging devices has further impacted the daily use of the network. The humid and hot campus environment poses challenges, as it can lead to increased wear and tear on cables and equipment.
- Customers are highly sensitive to the delivery time.

Solution Value Delivery

Attract the user with the WIS solution and Wi-Fi 6 products and lead the project. Ruijie Networks has formed a strong partnership with the customer and has provided the WIS & Wireless solution in the Purwokerto campus as a pilot project. Ruijie Network's stability and ultra-high-performance wireless products showcase their strength. The easy O&M as well as the comprehensive management have received high recognition from the customer.

Ruijie Networks wins the first benchmark in **WIS Cloud and Wi-Fi 6 Product** in GE APEC.

Universiti Teknologi MARA
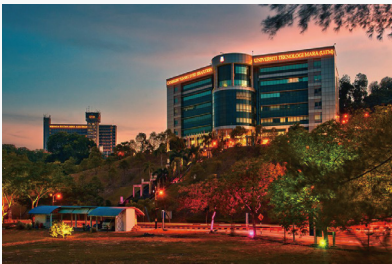
Wireless Campus Network in Universiti Teknologi MARA

Customer Profile

Universiti Teknologi MARA (UiTM) is the largest university in Malaysia (ranking the 13th) as measured by infrastructure and student enrollment (58,000+). The university comprises one main campus and 34 satellite campuses.

Universiti Teknologi MARA (UiTM)

Customer Pain Points

- Aging switches and wireless devices are used.
- New campus buildings require network construction, including wireless devices and switches.

Solution Value Delivery

The customer has been impressed with the product quality and the SOE solution. The stability, reliability, and satisfactory performance demonstrated in the POC have earned Ruijie Networks the highest score among many competitors in the test.

Ruijie Networks has successfully made a breakthrough with the lighthouse customer of **Universiti Teknologi MARA (UiTM)** in Malaysia.

More Information

For more information about Ruijie Networks, visit the official website or contact your local distributor:

- **Ruijie Networks official website**: https://www.ruijienetworks.com/
- **Online support**: https://www.ruijienetworks.com/support
- **Hotline support**: https://www.ruijienetworks.com/support/hotline
- **Email support**: service_rj@ruijienetworks.com