



- 768 Ports, 17 Vertical Slots with a Maximum Configuration of 1 MSC Card and 16 Line Cards
- Multi-service Interfaces Including ADSL2/2+, G.SHDSL.BIS, VDSL2 and VOIP
- IP-aware Bridge to Facilitate Mac Address Limitation and Security Breach of Large-scale Layer 2 Infrastructure Deployment
- Comprehensive QoS to Enhance Triple Play Users' Experience
- Field Proven IGMP v1, v2 Snooping and Proxy for IPTV Deployment
- Flexible ACL, VLAN-aware DHCP and Anti-IP/MAC Address Spoofing to Prevent Malicious Attack
- DHCP Option 82 Relay and ARP Proxy Build in to Boost the Stability of Network



12.5U IP DSLAM with  
Dual DC Power Input

IES-6000

## Future Proof Next Generation Multi-Service IP Access Solution

### Benefits

#### Future Proof Architecture

As the flagship of ZyXEL's IP DSLAM product portfolio, the IES-6000 is equipped with non-blocking Gigabit backplane, failover-enabled Management Switch Cards (MSC), dual input power modules and various high-port density multi-purpose line cards. With comprehensive IP-centric firmware features, the IES-6000 is a high-capacity system that facilitates Telco/ISP to deliver high-quality residential or business user services experience at competitive CAPEX/OPEX as well as satisfying its current and future infrastructural requirements of reliability, flexibility and scalability.

#### Easy & Reused Logistics

The IES-6000 is a 12.5 U-height, 17-slot chassis-based IP DSLAM capable of adopting the same Multi-Service line cards as those installed in IES 5000/5005 system. A new introducing MSC1024G control card with 8G grouping uplink is designed to plug into slot 8 and/or slot 9, while the remaining slots are available for equipping various line cards. Followed by MSC1224G, two 10G Gigabit Ethernet over fiber uplink will be available in near future. The variety of line cards are including 48-port ADSL2+ line cards (over POTS and ISDN individually) that provide subscribers with asymmetric transmission bandwidth up to 25 Mbps/2.4 Mbps; 48-port SHDSL.bis line cards with symmetric transmission bandwidth of 4.096 Mbps (2-wire), 8.192 Mbps (4-wire) and 16.384 Mbps (8-wire); 24-port VDSL2 line cards that offer up to profile 17a (100 Mbps/50 Mbps)\* high-speed connectivity per port over copper wires as well as 48 ports VoIP line card that support either H.248 or SIP protocol. The primary designed concept of IES 6000M is also taking account of the further technology evolution such as GPON.

#### Advanced Triple Play and Mass Deployment Functionality

The IES-6000 inherits all the Layer 2 and Layer 3 QoS, security and multicast functionalities from the IES-5000/5005, while the following new features are added to satisfy the requirements for massive field deployments: (1) IP bridge functionality that alleviates the Layer 2 access network deployment restrictions resulted from MAC address table limitation and security attack issues; (2) ARP Proxy which minimizes the ARP broadcast requests to all subscribers; (3) TACACS+ mechanism to support remote authentication with TACACS+ servers; (4) VLAN-aware DHCP snooping which adds VLAN information into DHCP snooping tables; (5) DHCP option82 sub-option2 for providing remote client ID information to DHCP servers for flexible IP address assignment. (6) Cluster management feature that is able to reduce the OPEX of multiple DSLAM maintenance.

## Robust Physical Safety Design

The IES-6000 supports 1+1 MSC redundancy with a failover switch time less than 1 second. In addition, voltage, temperature and FAN speed sensors are fitted into the system. When an abnormal condition is detected, the LED displays and/or the corresponding alarms will alert administrators of the situation. In case the system temperature rises over the preset threshold, thermal cutoff protection will kick in to shut down the system automatically.

## Sophisticated OAM&P Features

The IES-6000 provides various management methods: local console port, Web-based configuration, Telnet and SNMP v1/v2/v3-based EMS (NetAtlas Access EMS). The management functions include Alarm and Status Surveillance, Configuration management, Performance management and Fault management. The IES-6000 allows multiple administrative accounts with 3-level access privileges. Accounts with the first-level privilege have full access to all management objects on the Management Information Base (MIB). Second-level accounts have similar access rights except creating new administrative accounts, while the third-level accounts are granted read-only access rights to the MIB objects. NetAtlas Access EMS also provides view-based MIB management that partial MIB objects can be defined and accessed for customization and security reasons. In addition, Cluster Management enables multiple DSLAM administration with single/master IP address, XML-based northbound interface is equipped to interoperate with external OSS systems.

# Specifications

## System Specifications

### DSL Compliant

- ADSL:
  - G.992.1 Annex A, G.992.3 Annex A, G.992.5 Annex A
  - G.992.1 Annex B, G.992.3 Annex B, G.992.5 Annex B
    - Support G.992.3 and G.992.5 Spectral Mask
    - Support Annex M and Annex L in G.992.3 and G.992.5
    - Support EOC and Overhead Channel Access
    - Support the latency path function
    - Support loop diagnostic function specified
    - Support the power management capability
    - Support the capability of the Seamless Rate Adaptation (SRA) on-line configuration
    - Single and Dual end loop test
- SHDSL: G.991.2, G.991.2.bis
- VDSL2: G.993.2, G.994.1, G.997.1

### ATM Traffic Management

- 8 VPC/VCC per DSL port
- Support UBR, CBR, rt-VBR, nrt-VBR, ABR QoS Mechanisms
- Support ATM Forum TM 4.0 peak cell rate traffic parameter
- Support downstream traffic shaping function per ATM PVC
- Support ATM F5 OAM cells for End-to-End Loop back test (ITU-T Rec. I.610)

### Performance

- Eight queues with packet priority scheduling (SPQ, WRR)
- Support 512 IGMP multicast groups

- The maximum channel zapping processing time is 250 ms
- DSCP to 802.1p mapping

### Security

- Per Port and Per VLAN isolation
- IEEE 802.1x (Authentication)
- Rule-based packet filtering (L2 ~ L4 ACL)
- MAC count limiting
- ARP broadcast filtering
- DHCP broadcast filtering
- VLAN aware DHCP snooping
- NetBIOS filtering
- IGMP filtering
- Anti IP/MAC address spoofing
- Support TACACS+ remote authentication

### VLAN

- 4094 IEEE 802.1Q compliant VLAN tagging
- VLAN stacking (Q-in-Q)
- VLAN Bridge Function (multiple PVCs to one VLAN)(N:1)
- PVC and VLAN one to one mapping (1:1)
- VLAN Trunking (Single PVC join Multiple VLAN)(1:N)
- Support GVRP function

### Traffic Management

- Bandwidth control and Broadcast/Multicast/Unknown Unicast control on Gigabit Ethernet ports
- RSTP : IEEE 802.1d, IEEE 802.1w, IEEE 802.1s
- IP Bridge
- IEEE 802.3ad (Link Aggregation Control Protocol)
- IP multicast forwarding

- IGMP v1, v2 snooping/proxy
- IGMP multicasting channel limiting
- VLAN aware DHCP snooping
- DHCP Relay Option 82 with Sub-option 1 & 2
- PPPoE intermediate Agent
- Multicast bandwidth control
- L2~L4 ACL
- IGMP group count/filtering profile

### Network Management

- Local management through a craft terminal
- Web-based Management Interface
- Cluster Management (Up to 8 cluster members)
- View-based Network Management
- XML-based North Bound Interface
- In-band and out-of-band IP interface for management (SSH, SFTP)
- SNMP Management (through ZyXEL NetAtlas Access EMS)
  - SNMPv1/v2c/v3 agent/traps
  - Standard MIBs
    - RFC 1213 MIB II
    - ADSL Line MIB (RFC2662)/Extension Line MIB (RFC 3440)
    - SHDSL Line MIB (RFC 3276)
    - VDSL line MIB (RF3728)
    - Bridge MIB/Extension MIB
    - RMON MIB (RFC 1757)
  - Vendor specific MIBs, e.g.,
    - Chassis Management MIB (Fan Speed, Voltage, Temperature)

## Hardware Specifications

### IES-6000M

- 17-slot rack mountable enclosure, 19" or 23" chassis
- Maximum 16 slots for DSL line cards (slot 1 ~ 7, 8 or 9, 10 ~ 17)
- 2 slots for management and switch cards (slot 8 & 9)
- 2 DC power input module and filter
- One FAN and dust filter module
- One Alarm Module

### ALC1248G-51

- Hot swappable 48-port ADSL2/ADSL2+ Annex A line card
- Maximum transmission rate up to 25 Mbps/ 2.4 Mbps for ADSL2+
- One mini-RJ11 console port
- One gigabit backplane
- Support G.992.3 and G.992.5 Spectral Mask
- Support EOC and Overhead Channel Access defined in G.992.3 and Rec.G.997.1
- Support the latency path function specified in G.992.3 and G.992.5
- Support Annex L and Annex M specified in G.992.3 and G.992.5
- Support loop diagnostic function specified in G.992.3 and G.992.5
- Support the power management capability specified in G.992.3 and G.992.5
- Support the capability of the Seamless Rate Adaptation (SRA) on-line configuration specified in G.992.3 and G.992.5

### ALC1248G-53

- Hot swappable 48-port ADSL2/ADSL2+ Annex B line card
- Support Annex M and Annex L specified in G.992.3 and G.992.5
- Maximum transmission rate up to 25 Mbps/ 2.4 Mbps for ADSL2+
- One mini-RJ11 console port
- One gigabit backplane

### SLC1248G-22

- Hot swappable 48-port SHDSL/SHDSL.bis line card
- Support ETSI TS 101 524 V 1.2.1, ITU-T G.991.2, ITU-T G.991.2.bis
- Symmetric transmission rate of 4.096 Mbps (2-wire), 8.192 Mbps (4-wire) and 16.384 Mbps (8-wire)
- One mini-RJ11 console port
- One gigabit backplane

### VLC1224G-41A

- Hot swappable 24-port VDSL2 line card
- Support G.993.2, G.994.1, G.997.1
- Maximum transmission rate up to 100 Mbps/ 45 Mbps
- One mini-RJ11 console port
- Two gigabit backplane
- Support VDSL2 profiles 8a, 8b, 8c, 8d, 12a, 17a
- Support frequency allocation bandplan Annex A, Annex B 998.A, 998.B, 998.M
- Support U0 band, customer PSD, RFI notch, single latency in PTM mode (64/65 encapsulation) and INP
- Support UPBO, Reed Solomon and Trellis coding

### MSC1024G

- Failover-enabled Network Termination Card
- Embedded 48G, non-blocking full duplex switching fabric
- 8 Gigabit Ethernet uplink & subtending ports:
  - 4 optical fiber port (SFP modules) for uplink traffic aggregation
  - 2 100/1000Base-Tx interface module for subtending
  - 2 1000 Mbps interface modules (combo design, SFP + copper) for dynamic adjustment about subtending and uplink aggregation, depending on the practical deployment requirement
- 4 trunking group, each group has 6 member ports in maximum
- One RS232 (DB-9) serial console port
- One 10/100 M out-of-band Mgmt interface
- 16 Gigabit Ethernet (SerDes) backplane interface
- 16 K MAC addresses
- 512 L2 multicast groups (1 K scalability)
- 4 K VLANs

### VOP1248G-61

- 48-port line card
- Support H.248 version 2 or SIP singling protocol
- Compatible CPE including, POTS phone, Fax, Analog Modem and Pay phone
- Support G.711 a/μ, G.726, G.729 a/b G.723.1\*
- 20 K Business Hour Call Attempts (BHCA)
- Configurable jitter buffer
- Support the generation of dial tone, second dial tone, ringing tone (ring-back tone), busy tone, off-hook warning tone
- Support call waiting, call hold, call transfer, return and call back on busy
- Emergency call local route\*
- Local dial available\*
- MLT (Metallic loop testing for subscriber lines) and GR-909 loop diagnostic

## Physical Specifications

### IES-6000M

- Dimensions: 439.2 (W) x 280.5 (D) x 543.3 (H) mm
- Weight: 15 Kg

### ALC1248G-51

- Dimensions: 390.6 (W) x 240 (D) x 13.8 (H) mm
- Weight: 0.5 Kg

### ALC1248G-53

- Dimensions: 390.6 (W) x 240 (D) x 13.8 (H) mm
- Weight: 0.5 Kg

### SLC1248G-22

- Dimensions: 390.6 (W) x 240 (D) x 13.8 (H) mm
- Weight: 0.5 Kg

### VLC1224G-41A

- Dimensions: 390.6 (W) x 240 (D) x 13.8 (H) mm
- Weight: 0.5 Kg

### MSC1024G

- Dimensions: 390.6 (W) x 240 (D) x 13.8 (H) mm
- Weight: 0.6 Kg

### VOP1248G-61

- Dimensions: 390.6 (W) x 240 (D) x 13.8 (H) mm
- Weight: 0.5 Kg

## Environmental Specifications

- Operating temperature: 0°C ~ 50°C
- Storage temperature: -40°C ~ 70°C
- Humidity: 10 ~ 95% (non-condensing)
- Power Supply: -36 ~ -72 VDC
- Power Consumption:
  - IES-6000: 1080 W
  - MSC1024G: 30 W
  - ALC1248G-51/53: 70 W
  - SLC1248G-22: 60 W
  - VLC1224G-41A: 80 W

## Certification

- CE
- UL 60950, CSA 60950
- FCC part 15 class A
- ITU-T K.20
- ETSI 300 019
- EN55022 class A
- EN55024 class A
- ETSI 300 386
- NEBS

## IES IP DSLAM Family Matrix

Model	IES-1000	IES-1248	IES-5005	IES-5000	IES-6000	
<b>System Overview</b>						
Dimensions W x D x H (mm)	440 x 320 x 44.5	440 x 251 x 66	440 x 250 x 152	440 x 250 x 289	439.2 x 280.5 x 543.3	
Splitter	Built in	Built in	Separated	Separated	Separated	
Rack Mountable	19" 1U	19" 1.5U	19" 4U	19" 6.5U	19" 12.5U	
Total Slot No.	2	NA	5	10	17	
Max DSL Line Card Slot	2	NA	4	8	16	
Max DSL Port No.	24	48	192	384	768	
Management & Switching Card Redundancy	NA	NA	NA	Yes	Yes	
Power Input	AC or DC	AC or DC	DC	DC	DC	
Power Redundancy	NA	NA	Yes	Yes	Yes	
Hot Swappable	Yes	NA	Yes	Yes	Yes	
<b>Interfaces</b>						
Uplink	2FE	2 100/1000Bast-T or 2 Mini GBIC	4GE	4GE	8GE or 10G (future)	
Subtending	Yes	Yes	Yes	Yes	Yes	
ADSL2/2+ Line Card	Yes	Yes	Yes	Yes	Yes	
SHDSL Line Card	Yes	NA	Yes	Yes	Yes	
G.SHDSL.bis	Yes	NA	Yes	Yes	Yes	
VDSL2 Line Card	NA	NA	Yes	Yes	Yes	
VoIP Line Card	NA	NA	Yes	Yes	Yes	
<b>QoS Function</b>						
802.1p Priority Queuing	4 Queue	4 Queue	8 Queue	8 Queue	8 Queue	
802.1q Tag-based VLAN	256 VLAN	1024 VLAN	4K VLAN	4K VLAN	4K VLAN	
SPQ/WRR	SPQ	SPQ, WRR (future release)	SPQ, WRR	SPQ, WRR	SPQ, WRR	
ATM QoS to 802.1p Priority Mapping	Yes	Yes	Yes	Yes	Yes	
DSCP to 802.1p Mapping	Yes	Yes	Yes	Yes	Yes	
IP Bridge	NA	Yes	Yes	Yes	Yes	
<b>Security Function</b>						
IEEE 802.1x	Yes	Yes	Yes	Yes	Yes	
Multiple PVC per Port	8	8	8	8	8	
Q in Q (VLAN Stacking)	Yes	Yes	Yes	Yes	Yes	
DHCP Snooping	Yes	Yes	Yes	Yes	Yes	
DHCP Relay Option 82	Yes	Yes	Yes	Yes	Yes	
MAC/Packet Filtering	Yes	Yes	Yes	Yes	Yes	
MAC Count Filtering	Yes	Yes	Yes	Yes	Yes	
Packet Filtering	Yes	Yes	Yes	Yes	Yes	
IEEE 802.3ad Link Aggregation	NA	NA	Yes	Yes	Yes	
<b>ACL/Filtering</b>						
ACL Filtering	Source MAC Address Filtering	Yes	Yes	Yes	Yes	Yes
	PPPoE Filtering	Yes	Yes	Yes	Yes	Yes
	Layer 1 ~ 4 Filtering	Yes	Yes	Yes	Yes	Yes
	ARP Broadcast Filtering	Yes	Yes	Yes	Yes	Yes
	NetBIOS Filtering	Yes	Yes	Yes	Yes	Yes
	DHCP Broadcast Filtering	Yes	Yes	Yes	Yes	Yes
IGMP Filtering	Yes	Yes	Yes	Yes	Yes	
<b>Multicast Function</b>						
IGMP v1, v2	Snooping	Yes	Yes	Yes	Yes	Yes
	Proxy	Yes	Yes	Yes	Yes	Yes
	Filtering Profile	Yes	Yes	Yes	Yes	Yes
GVRP	Yes	Yes	Yes	Yes	Yes	
VLAN	Static Multicast Group	Yes	Yes	Yes	Yes	Yes
	Multicast VLAN	Yes	Yes	Yes	Yes	Yes
<b>Network Management</b>						
SNMP v1, v2	Yes	Yes	Yes	Yes	Yes	
SNMP v3	NA	Yes (future)	Yes	Yes	Yes	
Web Management	Yes	Yes	Yes	Yes	Yes	
CLI Management	Yes	Yes	Yes	Yes	Yes	
Cluster Management	NA	NA	Yes	Yes	Yes	
XML North Bound Interface	Yes	Yes	Yes	Yes	Yes	
EMS Management	NetAtlas Windows/UNIX Version	NetAtlas Windows/UNIX Version	NetAtlas Windows/UNIX Version	NetAtlas Windows/UNIX Version	NetAtlas Windows/UNIX Version	

\* Future release

## System Architecture



### IES-6000M

- 17 slots rack mountable enclosure, 19" or 23" chassis
- Maximum 16 slots for xDSL or VoIP line cards (slot 1 ~ 7, 8 or 9, 10 ~ 17)
- 2 slots for management and switch cards (slot 8 & 9)



**ALC1248G-51**



**ALC1248G-53**



**SLC1248G-22**



**VLC1224G-41A**



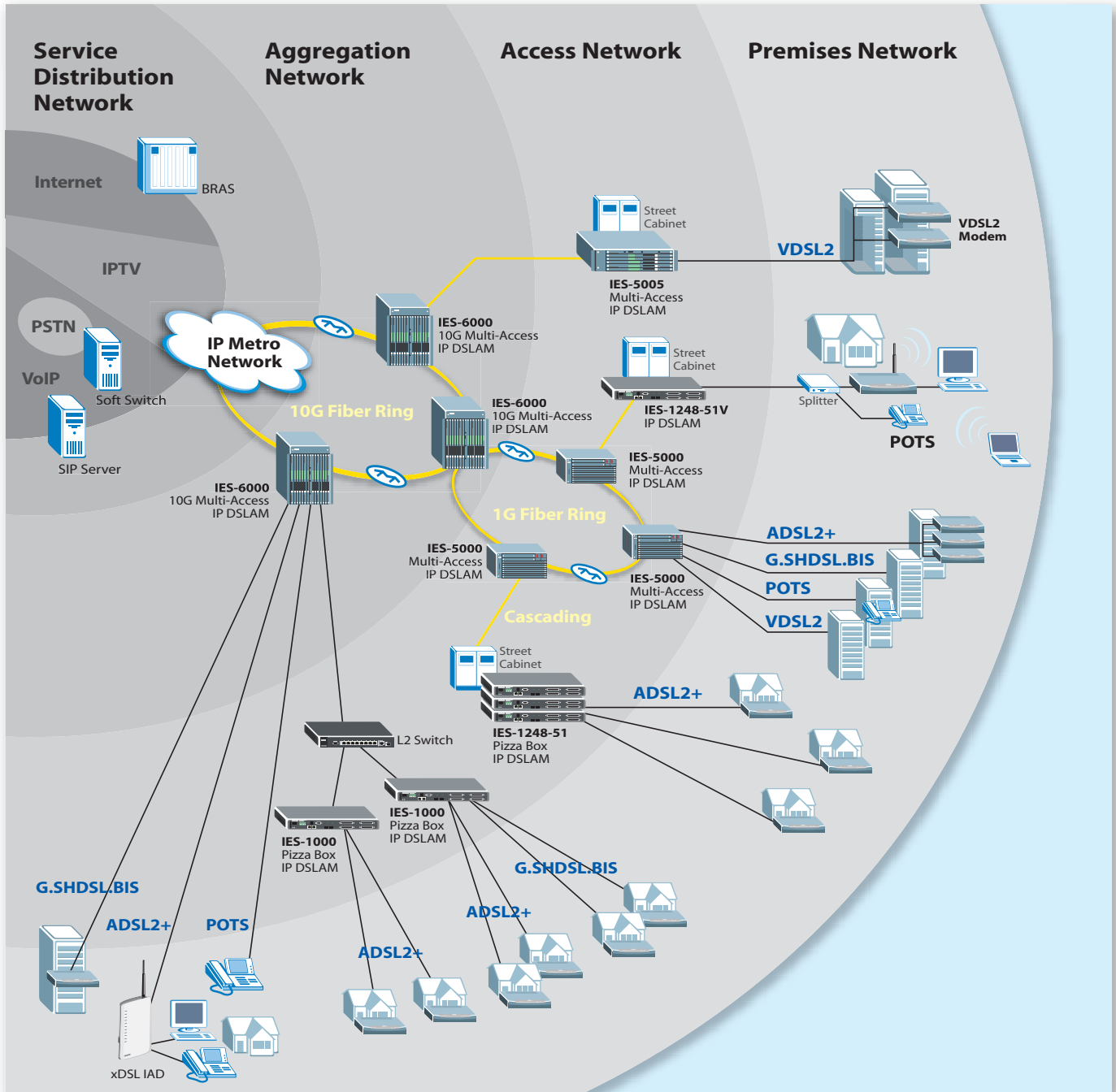
**MSC1024G**



**VOP1248G-61**

# Application Diagram

## Network Topology for All IP DSLAM Products



For more product information, visit us on the web [www.ZyXEL.com](http://www.ZyXEL.com)



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