Voice over IP and IP Telephony

Application solution overview
Objectives

- Understand VoIP & IP Telephony technology
- Understand VoIP & IP Telephony network layout and environment
- Understand VoIP & IP Telephony challenges & APC Solutions
Agenda

- Architecture overview
- Key customer challenges
- APC solutions
- Customer testimonials
- Design tools / process
- Summary
- Review questions
- Reference materials
## Architecture Overview

### Environment Network Layers

<table>
<thead>
<tr>
<th>Environment</th>
<th>Network Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop</td>
<td>IP Phones</td>
</tr>
<tr>
<td></td>
<td>Edge routers/switches</td>
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<tr>
<td></td>
<td>Large backbone routers/switches</td>
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<tr>
<td></td>
<td>Application servers e.g. call managers, unified messaging</td>
</tr>
<tr>
<td>IDF / Wiring Closet</td>
<td>IP Phones, laptops, wireless hubs</td>
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<tr>
<td></td>
<td>Switches with inline power</td>
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<tr>
<td>Main Distribution Facility</td>
<td>Switches with inline power</td>
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<tr>
<td></td>
<td>Edge routers/switches</td>
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<tr>
<td>Data Center</td>
<td>Switches with inline power</td>
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VoIP and IP Telephony

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# Architecture Overview - Layers of Network

<table>
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<tr>
<th>Environment</th>
<th>Network Layers</th>
</tr>
</thead>
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<tr>
<td><strong>Office</strong></td>
<td>IP Phones</td>
</tr>
<tr>
<td><strong>IDF / Wiring Closet</strong></td>
<td><strong>Access Layer</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Distribution Layer</strong></td>
</tr>
<tr>
<td><strong>Main Distribution Facility</strong></td>
<td><strong>Core Switch</strong></td>
</tr>
<tr>
<td><strong>Data Center</strong></td>
<td><strong>Server Farm</strong></td>
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<tr>
<td></td>
<td><strong>Call Servers</strong></td>
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### Layer 1 - Physical Layer
- IP Phones, Wi-Fi Access Points

### Layer 2 - Distribution Layer
- Catalyst 1950, 2550 etc.

### Layer 3 - Core Layer
- Catalyst 3550, 4503 etc.

### Layer 4 - 7 - Application Layer
- Unity express, call manager etc.

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VoIP and IP Telephony
Key Challenges

Desktop
Phone availability is affected by power problems if the phone is powered locally.

IDF
Heat dissipation, physical space, high availability, and electrical wiring need to be quickly upgraded.
- Switches power the phones (15W per phone)
- Loads increase from 1000W max to >4000W
- Switches and UPS(s) require much more space
- Network must provide same availability levels as legacy telephony

MDF
Physical infrastructure (rack, power, and cooling) needs a quick upgrade.
- UPS loads are much larger than the existing UPS can handle.
- The current UPS/Cooling solutions are not designed to provide the new availability requirements.
- Entire infrastructure may need to be replaced due to space problems

Data Center
Racks must be quickly integrated into the data center infrastructure for new switches and servers.
APC Solutions
Key Considerations for Solutions

Power
- Size the total UPS load not just the switch and beware of how the phones are powered.
- Provide ample run time across the network- 1 to 2 hours is a typical requirement for phones.
- Determine needed availability requirements (N+1 Redundant, 2N redundant, etc.)

Racks
- Select open racks for switches with side-to-side air flow.
- Choose racks that will support the larger UPS and battery frames.
- Ensure availability of enough receptacles and that PDU strips won't be overloaded.

Cooling
- Ensure solution allows monitoring of temperature in the room.
- Identify increased ventilation/cooling needs and supplement as needed.

Management
- Design a complete management strategy for entire infrastructure rather than individual equipment.
- Ensure a sound strategy for networks with many remote sites.

Services
- Consider on-site service for locations with little or no support staff; Needs Assessment surveys and Expert Installation.
Challenge: Desktop Environment

Environment
- Technology user’s desk in office or cubicle
- Shelf

Technology
- Phones, Laptops, Wireless hubs, etc.
  - Some plug into wall at user’s desk
  - Newer Devices draw (48VDC) Power over Ethernet (PoE) from the IDF switch or Midspan power device fed by the switch
- Typical Power Draw
  - 6-7 watts
  - Max 15W-new Standard IEEE802.3af

Challenge
- Phone availability is affected by power problems if the phone is powered locally.
APC Solution for Desktop

Power
- Plug all office equipment into one UPS
  - IP Phone
  - WiFi Hub/Router
  - Web Security Camera
  - Printers/Fax/Peripherals
- Protect from surge traveling over phone/cale lines
- Prevent data loss and file corruption

Management
- PowerChute® Personal Edition
  (easy to use, safe system shutdown with sophisticated power management functions)
APC Solution for Desktop Environment

Back-UPS ES and HS 350VA – 725VA

Protection
- Battery power prevents data loss and file corruption
- Offers protection from surges traveling over phone lines
- File-saving, automatic shutdown software protects files even when the user is not around

Convenience
- Use transformer block plugs without blocking other outlets
- Automatic diagnostic testing provides proactive notification of the need to replace the battery

The most popular UPS in the world!
Challenge: IDF Environment

Environment
- Close to technology user
- Small room or closet, shared space like a store room, locked rack enclosure
- 120V available; 208V requires rework
- Comfort cooled at best
- 2-post racks

Technology
- Switches, routers, patch panels
- Typical Power Draw:
  - Small office-500W
  - Large office-up to 4000W

Challenge
- Heat dissipation, physical space, high availability, and electrical wiring need to be quickly upgraded.
APC Solution for Typical IDF

Power
- **Smart-UPS® XL** or **Smart-UPS RT**: For SMB IDF having stackable switches
- **Symmetra® RM** or **Symmetra LX**: For enterprise IDF having chassis based switched

Racks/Power Distribution Units (PDUs)
- 2-post Open Rack: For Smart-UPS XL or Smart-UPS RT
- 4-post Open Rack: For Symmetra RM or Symmetra LX
- PDUs: Users can plug the electric loads directly into the UPS (extra Rack PDUs can be added as needed)

Cooling
- **NetworkAir™ CM or PA**: For supplemental cooling

Management
- **Environmental Monitoring Unit/Card**
- **UPS Network Management Cards**: Helps monitor and control UPSs connected to servers and other networking equipment
- **InfraStruXure™ Manager Appliance**: Browser-accessible, user-friendly tool to easily manage your entire APC network critical physical infrastructure (NCPI)

Service
- **Needs Assessment and Power Audits**: For VoIP network planning (Should coincide with Network Assessment Service)
- **On-Site Service**: For non-staffed locations
- **Remote UPS Monitoring**
APC Solution Applied for IDF

InfraStruXure Solution for Closet
Challenge: MDF Environment

Environment
- Computer room typical
- Sometimes small shared space
- Cement floor, tiled ceiling
- Cooled with building cooling system, sometimes precision cooling
- Mixture of open racks and enclosures

Technology
- Switches, routers, application servers
- Typical Power Draw
- 4kW to 40kW
- Single or three phase

Challenge
- Physical infrastructure (rack, power, and cooling) needs a quick upgrade.
APC Solution for Typical MDF

Power
- Smart-UPS XL or Smart-UPS RT: For 1-2 racks
- Symmetra RM or Symmetra LX: For 2-10 racks
- Symmetra PX or Smart-UPS VT: For >10 racks

Racks/PDUs
- 2-post Open Racks: For switches with side-to-side air flow
- NetShelter Enclosures: For servers and switches with front-to-back air flow
- Basic PDU: For small MDF
- Metered or switched PDU: For larger mission-critical installations

Cooling
- NetworkAir CM, PA or FM: For additional cooling

Management
- Environmental Monitoring Unit/Card
- UPS Network Management Card
- InfraStruXure Manager Appliances

Service
- Needs Assessment and Power Audit
- Onsite Service with Preventative Maintenance
- Remote UPS Monitoring
Challenge: Data Center

Environment
- Environmentally controlled room
- Enterprise and large midsize companies
- All power options readily available
- Four post rack enclosure for servers
- Open racks for switches/networking

Technology
- Call servers, application servers, backbone switches
- Typical power draw
  - 10kW to several MW
  - Three phase UPS typically used

Challenge
- Racks must be quickly integrated into the data center infrastructure for new switches and servers.
APC Solutions for Data Center

Power
- Symmetra PX or Smart-UPS VT

Racks/PDUs
- NetShelter Enclosures: For servers
- 2-post Open Racks: For switches with side-to-side air flow
- Metered or switched PDU
- Rack ATS: For single or triple corded loads

Cooling
- NetworkAir FM, IR, AFX and CW: Provides modular floor-mount precision air conditioning for environmentally-sensitive equipment areas (Air, water, glycol-cooled)

Management
- Environmental Monitoring Unit/Card
- UPS Network Management Card
- InfraStruXure Manager Appliances

Service
- Needs Assessment and Power Audit
- Installation Services
- Network Integration
- Onsite Service with Preventative Maintenance
- Remote UPS Monitoring
"Availability is even more critical in our new environment, because the phones are now run over the network," says Mr. Shah. "The bottom line was that integrating InfraStruXure directly with our high-availability network components made a lot of sense."

Kamal Shah
Vice President and Group IT Director
Tremont Advisers, Inc., Subsidiary of Oppenheimer Funds Inc.

"The APC Symmetra® RM backing up our Cisco network installation at the Summit of the Americas helped keep the lines of communication open."

Trevor Rodriguez
Program Manager
Cisco Systems
Related Solutions

**Patch Panels & Cables**
High quality, manufactured to industry standards to keep your network running.

**Surge Protection**
To safeguard your sensitive electronic equipments from everyday power surges and lightning strikes.

**Netshelter Accessories**
Cable & thermal management accessories, shelving, mounting hardware, keyboard drawers, stabilization and grounding kits etc.

**InfraStruXure Solutions**
Fully integrated, pre-engineered rack based power, cooling and environmental management that are scalable.
Design Tools

- WWW.APC.COM
  - APC InfraStruXure Estimator/Configurator (with IT Channel Partner)
  - APC UPS Selector
  - APC Rack Configurator
VoIP Architecture/Solution Overview

Higher Availability and Most Comprehensive End-to-End Solutions
FAQs

- When do I need a UPS for an IP Phone?
- What new challenges arise in the IDF when you implement VoIP?
- What new challenges arise in the MDF when you implement VoIP?
- My call processing and unified messaging servers are being placed in a data center that has UPS protection. When do I need a separate UPS for them?
- Any other questions you have?
Reference Materials

List of related articles and any references this information came from

- **APC White Paper # 69**
  Power and Cooling for VoIP and IP Telephony Applications

- **APC Application Note # 50**
  APC Power Protection for Cisco VoIP and IP Telephony Solutions

- **APC Application Note # 51**
  APC Solutions for Nortel’s Business Communications Manager

- **APC VoIP Brochure Part # DSN-1017**