Benefits of Using PoE in Fire Alarm Systems

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Agenda

• What’s PoE

• How PoE works

• Value of PoE

• Trend of building automation

• Benefit of using PoE in fire alarm systems
PoE Overview

44V – 57V DC

<= 100m
IEEE Standard History

Class 0-3:
- PSE = 15.4W
- PD = 13W

Class 4:
- PSE = 30W
- PD = 25.5W

Class 6:
- PSE = 60W
- PD = 51W

IEEE 802.3af
- 2003

IEEE 802.3at
- 2009

IEEE 802.3bt
- 2018

Class 7:
- PSE = 75W
- PD = 62W

Class 8:
- PSE = 90W
- PD = 71W
How PoE Works

Applied PSE Voltage

Detection

1st Class
New long 1st class finger "informs" PD that the PSE will support the new MPS timings

2nd Class
30W 2 pair

3rd Class
30W 4 pair

4th Class
60W 4 pair

5th Class
90W 4 pair

1st PD Class Resistor

2nd PD Class Resistor

Powered On
How PoE Works - Detection

\[ R_{21} = \frac{V_{p2} - V_{p1}}{I_{p2} - I_{p1}} \]
\[ R_{41} = \frac{V_{p4} - V_{p1}}{I_{p4} - I_{p1}} \]
\[ R_{23} = \frac{V_{p2} - V_{p3}}{I_{p2} - I_{p3}} \]
\[ R_{43} = \frac{V_{p4} - V_{p3}}{I_{p4} - I_{p3}} \]

\[ I_{p1/p3} = 160\text{uA} \]
\[ I_{p2/p4} = 270\text{uA} \]

\[ R_{\text{OPEN}} > 52.5\text{k}\Omega \]
\[ 33\text{k}\Omega \leq R_{\text{REJ\_HIGH}} \leq 50\text{k}\Omega \]
\[ 19\text{k}\Omega \leq R_{\text{ACCEPT}} \leq 26.5\text{k}\Omega \]
\[ 1.5\text{k}\Omega \leq R_{\text{REJ\_LOW}} \leq 15\text{k}\Omega \]
\[ R_{\text{SHORT}} < 400\Omega \]
How PoE Works - Classification

<table>
<thead>
<tr>
<th>Class</th>
<th>I_{CLASS} Range (mA)</th>
<th>Power Sourced (W)</th>
<th>Power Delivered (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 – 4</td>
<td>15.4</td>
<td>13</td>
</tr>
<tr>
<td>1</td>
<td>9 – 12</td>
<td>4</td>
<td>3.84</td>
</tr>
<tr>
<td>2</td>
<td>17 – 20</td>
<td>7</td>
<td>6.49</td>
</tr>
<tr>
<td>3</td>
<td>26 – 30</td>
<td>15.4</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>36 - 44</td>
<td>30</td>
<td>25.5</td>
</tr>
</tbody>
</table>
Value of PoE

1. Lower cost on system BOM and installation
   - Reduce extra power adapter and cable
   - No electrician required for installation, and the device is connected by RJ45 port through CAT5 cable

2. Safety
   - PoE has multiple levels of protection for overload, short circuit and over temperature.
   - PoE device performs handshaking before delivering power. This prevents damage from incorrect installation or unknown devices.

3. Flexibility
   - 100m of cable enables devices to be installed at the remote place without AC plugs.
   - PoE pass through PoE power to be delivered to anywhere in the network with star connection or mesh connection over 100m distance

4. Intelligence
   - Central controller has access to every PoE port to get status and diagnosis system fault.
Value of PoE

5. Easy plug and play with Ethernet Alliance Certified Logo

- Confidence of interoperability between certified products
- It’s standards based and easy to recognize
- The arrows indicates the power direction (PSE/PD)
  - PSE: points out of the logo = sends power
  - PD: points into the logo = receives power
- The number indicated maximum power class supported

*PSE Class “4” Logo*  
*PD Class “1” Logo*
Trend of building automation

PoE can be found in:
1. IP network camera
2. Video doorbell
3. Video recorder
4. Smart lock
5. Occupancy detection
6. Barcode scanner
7. Building security gateway
8. Video audio system/Emergency speaker
9. Thermal imaging fire detection
10. LED lighting
Fire Alarm Systems

Monitor panel -> Control Panel -> Central control room

IO Module
- Fire detector
- Temperature sensing
- Humidity sensing
- Alarm
- Buzzer

Ethernet

+PoE

Monitor panel -> Control Panel -> Central control room

IO Module
- Fire detector
- Temperature sensing
- Humidity sensing
- Speaker
- Buzzer
- Camera
Redundancy and Hitless Failover in Firealarm Systems

- Redundancy at a smaller scale (not power outage of building or data service drop)

- PoE redundancy focuses on failures of the Cat5e on both data and power
  - Switch is usually safe in a room while Cat5e can be installed different ways
  - Plug in/out, accidental trips, Cat5e damage, harsh conditions

- IoT - Data sensitive EE: emergency speaker, smoke detector, thermal imaging fire detection, IP camera, Occupancy detection

Ensures continuity of service, as the probability of power or data loss is very low.
Benefit of using PoE in Fire Alarm Systems

- Each smoke detector can have a unique IP address which is easy to be located when there is an alarm.
- Can trigger fire alarm automatically which saves time and reduces the lost.
- PoE redundancy input and battery input ensure the power presence to the fire alarm and smoke detector.
- Adding Occupancy detection also helps the control room to monitor who are in the area and take actions effectively.
- You get all of this for only $1.3 more per port!
Questions?