



## Half Day Seminar on Public Address System, 22 March 2016

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The Public Address (PA) system has been around since approximately a century ago. Although it's main role of serving as the most crucial communication system in a building during emergency remains unchanged over the decades, the technology that drives the system has undergone a steady revolution from analog-digital technology to the current networked technology.

Fundamentally speaking, a networked PA system may consist of networked switches, managed switches and routers. Networked switch processes and forwards data from one device to a destination device or devices. Managed switch can be used to configure virtual LAN while router provides the connection to Internet as well as connection to other router. Data transmission in a networked PA system is governed by the TCP/IP protocol. One considerable advantage of networked PA system over the conventional analog-digital PA system is the reduced dependency on the extensive cabling back to the control room in the latter. With a central LAN system as well as the employment of servers as a communication medium in a networked PA system, the cost of copper cables can be significantly reduced.

Other than the reduced dependency on cables, the networked PA system is also superior compared to the conventional PA system due to these reasons:

1. Ease of remote monitoring of systems which enables detection of faulty devices
2. Possibility of multiple building integration via LAN or over Internet
3. Greater flexibility and user-friendliness
4. Event logging which enables tracing back the history of usage of PA system with ease
5. No need of recording equipment
6. Possibility of remote paging

Table 1 summarises the different classes of networked PA system:

<b>Class 1 (Customize system)</b>	<b>Class 2 (Close system)</b>	<b>Class 3 (Open system)</b>	<b>Class 4 (Globalize system)</b>
Tailor-made for PA only using proprietary method and protocols to link equipment together without using network switches	Usually used by professional sound industry where stringent requirement on audio signals is in place. Utilize common network switches	Operates in a LAN network	Operates in Wide Area Network (WAN)
Low latency	Low latency	Server redundancy and fail-proof operation in different locations	Internet and IoT friendly
Simple configuration	Reduced cabling needs	Confined within a LAN network	Unlimited system scalability
Fully isosynchronous system	Sharp timing due to synchronous system clock	Latency up to 100ms	Network boundary extended to global level
Bottleneck issue as integration is done via an Agent PC	Only transmits uncompressed audio signal	Isochronous level up to 80ms	Worldwide PA system
High implementation cost as everything is proprietary and unique to the manufacturer	High bandwidth consumption	The Voice over Internet Protocol (VoIP) version has inherent limitation on PA system operation	Unified platform
Security by obscurity	Media signals can never be integrated into the other Extra Low Voltage (ELV) system as it only works on uncompressed audio signal		Harness the connectivity of multiple LAN via routers
Incompatibility issue with other system			Latency up to 100ms
Reusability and interfacing issue			Isochronous level up to 80ms

The strength of networked PA system can only be fully leveraged provided that integration either with other PA or other ELV systems such as lightning, (Heating, Ventilating and Air Conditioning) HVAC, fire alarm or Closed Circuit Television (CCTV) is in place.

Table 2 summarises the 4 levels of integration:

<b>Level 1 (Dry contact)</b>	<b>Level 2 ( High Level Communication)</b>	<b>Level 3 (Interoperability)</b>	<b>Level 4 (Convergence)</b>
Use of relays and optocouplers	Requires manufacturers to open up their protocols for intersystem communication	Unified platform for data exchange which allows multi-systems integration	Direct access to the front-end devices to construct high level functions
Reliable	Easier to implement compared to Level 1	Has a structured data communication	Dedicated sub-systems can get access to the front-end devices of other sub systems
Easy to implement		Possesses Event, Condition, Action (ECA) feature	Single server hosts all sub-systems practices
High implementation cost		Limited reach to the front-end devices dependent on Application Program Interface (API) provided by the manufacturers	The consolidated system can perform as if a single unified system
Troubleshooting-unfriendly		Requires a competent software engineer to write middleware software	Work with virtualization technology to provide server redundancy and minimize system downtime

PA system exists predominantly to protect human assets and even human lives during events of emergency. With the rapid digitalization of communication and networked technologies in the nation as reflected by terms such as smart city, smart building and Internet of Things (IoT), IP-based Networked PA systems may be the norm sooner than expected. Should engineers design buildings and infrastructures that can only support the conventional PA system technology or should they look ahead to accommodate Networked PA system?