# Application Note DQ2707-06
Implementing Large BvNet Systems

## Scope
This application note describes the limits which should be observed when designing a large system employing BvNet and PodWare.

### Computer
The PC software application PodWare makes very intensive use of the computer's resources when running sizable BvNet networks. The performance of the computer can have a significant effect on the performance of the network. Large systems will require a high performance machine. If there are more than 12 devices in the system, then the following is recommended:

- PC with >2GHz processor
- >2Gb RAM
- Windows7 operating system
- Do not open more control panels than necessary
- Ideally, keep all panels closed, using the Tree Alarms to do the monitoring

### Network Types
There are a number of ways to connect PodWare to devices:

- Serial (RS232) via the Linea BvNet USB/RS232 Interface
- USB via the Linea BvNet USB/RS232 Interface
- Ethernet via the Linea Ethernet Bridge
- Ethernet via the Linea Dante Bridge

### Numbers of BvNet Devices
There is a limit to how many BvNet devices can be attached to a network. These limits are not necessarily hard limits; usually it is a question of degradation of performance. The limits can be overcome by using multiple sub-networks. Each sub-net will have its own Network 'node' in PodWare, under which all the devices connected to that sub-network will appear.

- Maximum recommended devices per BvNet sub-net on a BvNet USB Interface: *32 (> 50 not supported*)
- Maximum recommended devices per Ethernet Bridge: 32 *(> 50 not supported*)
- Maximum recommended devices per Dante Bridge: *16 (> 25 not supported)*
- Maximum recommended devices per BvNet sub-net on multiple Dante Bridges : *32 (> 50 not supported)*
- Maximum number of sub-nets in PodWare: No practical limit

*Note that Dante Bridges will put all of the devices on the same sub-net, so it is not possible to build very large networks using Dante Bridges. However, up to 50 devices may be connected to PodWare via a number of Dante Bridges.*

### Isolation
The BvNet Network Isolator is essential in larger systems and in situations that could be electrically hostile. Isolators prevent problems with circulating ground currents and can also ease system design by allowing the creation of backbones and star topologies. By a star topology we mean that a single *logical* network (for example from a single Sentinel unit or PC interface can be split in to a number of *physical* network lengths, each one driven from its own Isolator.

Use an Isolator:

- On every device for creating a Backbone
- For creating a star point, one Isolator for every required spur
- On each subnet which is in a different ground zone

## Termination

As the network cable is technically a *Transmission Line*, depending on the characteristics of the cable, its length and the position of network devices along the cable, it is sometimes necessary to *Terminate* the cable. Please note that only *one* termination is permitted per backbone.

*Because determining when termination is required can be complex, Linea recommend the simple rule of terminating any network cable longer than 100m.*

Terminating a network cable involves adding an Active Termination Plug ZA1134 (Yellow) at the 'Link' socket of the last device at the far end of the cable run. Other forms of termination are available; please contact your vendor for details of these.

## Distances

Normally it is assumed that the location containing the Interfaces, Sentinels and Isolators etc. will be physically at one end of the network cable with the single terminator permitted on the other end. However it is permissible for this point to be positioned up to 100m from the un-terminated end of the cable without problems. If circumstances dictate that this distance will be exceeded then that length of cable should be fed from its own Isolator which must be terminated in the normal way.

**Data only - BvNet**

All network technologies will only operate reliably up to a certain maximum length of network cable. For data-only BvNet, the cable length limit is *not* the end-to-end distance; it is the length of *all* the cable in a given sub-net (the total length of cable driven by *one* Isolator for example) added together. This number is 1000 metres for data-only networks over standard Cat 5 cable, subject to the termination requirements above for lengths over 100m.

**Digital audio - BvNet2**

In addition to data, BvNet can also transport digital audio. Products that support this have their network ports labelled BvNet2. Transporting digital audio imposes limits on the attainable distances; the actual distance depending on the sample rate of the digital audio stream.

- For 48kHz sample rate the limit is 600m
- For 96 kHz sample rate the limit is 400m
- For other sample rates, please contact your vendor for advice

Please note that these lengths are total end to end distances. Due to the requirements of transporting digital audio, it is not permissible to construct networks with branches or stars; only point-to-point 'daisy chaining' is permitted.

**Distance v Number of Devices**

Longer cables will not support as many devices as shorter ones. This graph summarises the maximum number of devices that can be supported for a given distance (assuming that the limits mentioned above are not exceeded).

It assumes that the correct Termination has been applied to the cable run.

This is for guidance only, and generally shows worst-case. If your application will exceed these limits, please contact your vendor, since some device types, and alternative termination schemes may allow these limits to be exceeded.

Remember! Termination is required on networks over 100m in total length.