

# PANTOGRAPHIC SUPPORT

**NEXT GENERATION DEVICE HEALTHCARE**

## Synopsis

The same issues tend to happen on a lot of devices, but not in exactly the same way, and not on all the same devices. Pantographic Support provides a convenient and efficient way to adjust support solutions to match their environment.

## Precedent

A pantograph is a device that amplifies the movement of drawing a picture, so that following the lines of a small drawing can create a much larger version of the same drawing.

Solutions for support issues are rarely of the form where "one size fits all". Usually a solution will have the same general form for all devices, but will require some customization depending on certain characteristics of the device, or on certain requirements of the end users.

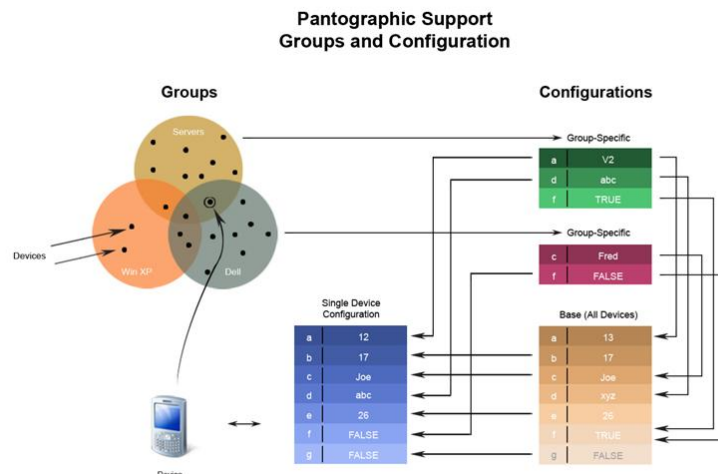
However, once a few customizations are determined, they apply to a large set of devices. A few small changes must be applied across a large number of devices. The process of making small changes with a large effect is similar in concept to the action of a pantograph, so we call it Pantographic Support.

## Detail

As described in Distributed Support, DARTs (Diagnosis, Analysis, and Resolution Tools) are the implementation of solutions for support issues. In order to provide a way to customize these support solutions, the engine has a mechanism for representing configuration information that DARTs use to control their operation.

This configuration information is very flexible. It can take the form of numbers, arbitrary text strings, booleans (check boxes), or push buttons used to initiate actions. Each configuration parameter has a label describing its meaning and a default value that it takes if it is not configured. The configuration interface is implemented using a database that shares the same schema on the server and client, making it easy to set up external interfaces when needed. The naming scheme used for the configuration interface is specifically designed to reduce version dependency, so that DARTs can easily be upgraded without losing their configuration.

Ordinarily, the configuration information is set up on the server using an interactive interface. However, this configuration can also happen on a client, using a local interactive interface. Some configuration changes happen as the result of an automatic process, either on the server or on the client (as a result of a decision made by a DART). This flexibility in defining the configuration provides many options in using different data sources for the information, and is also used in automating the configuration process when possible.



In addition to originating from multiple sources, configuration information can also propagate through multiple paths. The propagation mechanism is symmetric, so the information can move from server to client, from client to client, and from client to server. (The mechanism allows propagation from server to server, but this is not currently used.) The propagation on the client side is managed by a separate DART, giving the process even more flexibility and control.

Usually the configuration information is set up on the server, where it propagates to one client at a site, and then propagates from that client to all the other clients at the site through the local network. This distributes the load and holds down the network traffic at the server. It also reduces the likelihood of having a single point of failure.

The true power of Pantographic Support comes from the way that configuration information is applied to multiple devices. Groups of related devices are defined in such a way that a single group contains multiple devices, and a single device can be in multiple groups. Each group may or may not have a value for a particular configuration item, and the groups are defined with an associated priority. The value that is assigned to a particular device is the value from the highest priority group to which the device belongs, unless this is overridden by a specific assignment to a particular group. If no particular assignment applies, the default value is used.

The groups themselves can be defined in multiple ways. Of course, they can be defined manually, by selecting specific devices to be included. However, this is the least powerful way to define groups. Certain groups are defined automatically to reflect the structure inherent in devices being owned by a particular customer and being installed at a particular site. Other groups can be defined on the basis of events that happen on the device, or characteristics of the device that are part of its asset information.

Like the configuration information, group membership information propagates using a symmetric mechanism (once again, implemented using a DART), so this information can propagate once from the server to a device at a site, and then propagate from there to the other devices at the site. Groups are so flexible and powerful that they are used for other control mechanisms as well. Group membership is directly available for any DART to access, so the use of groups can be easily and conveniently extended as needed.

## Benefit

All support organizations benefit from the power of Pantographic Support.

- **Scalability**

1. The management complexity of support configurations and device groupings is only a function of the support issues themselves. The mapping to the actual devices being supported is done by the software, so supporting more devices requires no additional effort.
2. The distribution mechanism used for grouping and configuration takes advantage of local connectivity and local processing to spread the load over the devices being supported. Adding more devices does not dramatically increase the power needed at a single central resource.

- **Flexibility**

1. The general solution to a support issue can be customized to handle a wide range of environments. The customization can introduce the element of human judgement, which is often required since it is not possible to automate every decision in a support situation.
2. The customization and configuration can be used in any way the DART designer needs, rather than being constrained to a rigid set of requirements that were specified in advance.
3. Devices can be grouped and managed in flexible ways that adapt to the situation at hand.

- **Distributed nature**

1. The distribution mechanism used for grouping and configuration provides multiple paths for the data, and works well in situations where devices are connected intermittently or unreliably.
2. The availability of grouping and configuration information from multiple sources reduces the reliance on a central resource.

## Uniqueness

The advantages of grouping and configuration are so strong that other offerings provide limited forms of one or the other, or both. However, no other offering provides the true Pantographic Support found in Device HealthCare. Here are some tell-tale signs you can use to distinguish real Pantographic Support from weaker imitations.

- **Flexible group definition:** Groups can be defined using multiple methods, not just selecting devices from a list. Large groups can be defined quickly using the characteristics of the devices in relatively complex combinations.
- **Flexible group usage:** Groups can be used by support solutions for whatever purpose is appropriate, instead of just being applied in a single way that is designed into the system. Future support solutions can use the group mechanism in ways that have not yet been imagined.
- **Flexible configuration definition:** Configuration information can be defined in multiple places, and can even be part of an automated process. The definition of configuration information is well integrated with group definitions.
- **Flexible configuration usage:** Configuration information can be used by support solutions for whatever purpose is appropriate. The designer of the support solution can customize the operation using the configuration information in ways that have not yet been imagined.
- **Distributed architecture:** Definitions of group and configuration information are done in a distributed, reliable way that does not depend on a single central resource, and scales well for large numbers of supported devices.