Documenting Networks – Making Visio Work for You

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Its common sense that there should always be an up to date diagram to explain how a complex IT network is constructed and configured. But in practice the size, depth and complexity of modern corporate networks makes this very difficult. The industry standard MS Visio diagramming software is often used ineffectively, due to lack of awareness of its advanced features, making good documentation too costly and time consuming.

Documenting Networks – A Good Idea, Or A Sign of Mature Management?

It may seem obvious to document the critical communications infrastructure that a business relies on – how do you plan changes and identify faults without good documentation? The knowledge involving the components and configuration of network infrastructure is often recorded only because of individual (because it's what any professional engineer does) or corporate (we need to manage complexity across teams) culture. Where there is a contractual requirement, such as a managed or outsourced service, you would expect the supplier to maintain good records so the billing and support coverage will be consistent. You would expect there to be lots of up to date infrastructure diagrams available explaining different aspects of infrastructure operation and configuration. If only this was the case….

In the early days of networking we could always trace the wires to work out the network structure – but this doesn't work with high density virtual servers, SANs, VLANs, WANs and cloud computing. Failure to understand complexity results in unpredictable disruption, more effort reverse engineering, and repeated audits/verification exercises in response to issues that surface. A problem for many managers is that maintaining existing infrastructure diagrams is time consuming and requires a unique mix of skills.

A common issue for management is that few in IT have had training in the use of MS Office toolsets typically used by infrastructure teams. At recent IT conferences a show of hands revealed less than 2% of network specialists had even a basic course on MS Visio. While various management frameworks such as CMMI, ITIL, CoBit, ISO27001 all emphasise the value of processes, supported by maintained information sets with diagrams being included as managed objects, the reality is quite different.

What Types Of Visio Infrastructure Diagrams Are There?

Lots! Even more than you could think possible. Each specialist IT team has its own needs and the pictures on the right are just a small selection of those created. In one organisation there were over 18,000 Visio diagrams on their servers, though it was unclear which were accurate and who owned them. The answer was to create new diagrams which just added to the list. Increasing the number and scale of diagrams just makes it worse, so changing the approach and adopting new techniques such as infrastructure configuration management is vital.

For project tasks, diagrams have to be produced quickly such as proposed designs, to support build instructions, commissioning, etc. They tend to be focused to meet a specific need and are one off, for use by a limited set of people.

Diagrams used to support operational management and change processes tend to be wider in scope, where consistency in format and symbols is important as they are used for planning, fault finding and communicating risks. With larger environments the scale has to be broken down into manageable pieces with overviews, drilling down into detail. If you have 20 sites, you would expect 20 network diagrams to all use consistent terms and symbols if they are to be easily understood and differences easily visible.
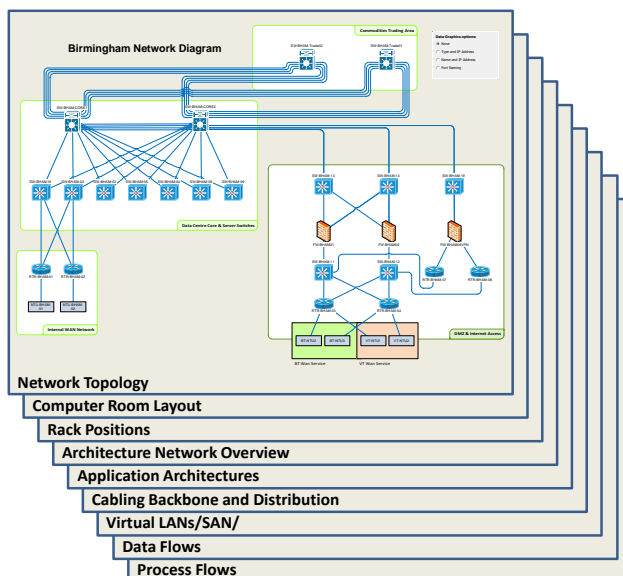
The example illustration shows different views of the infrastructure to suit particular needs for information. A specific server could appear in all of them, so a configuration change, such as a new network connection, should result in a change to all diagrams. If you had 500 servers then how many Visio diagrams would you expect there to be? Probably well over 1000 with the same server appearing multiple times.

Now think about the number of changes to IT components that occur across multiple sites on a regular basis. If you have 100 locations, should you have a network diagram for each, plus an overview? Or is it easier to worry about it when there is a change. If there are 100 rack diagrams, are they all up to date or should we check with a site survey? Every day of every week, there are tens of thousands of IT specialists planning projects, reverse engineering existing infrastructure and creating Visio diagrams inefficiently. If we could automate the creation and maintenance of these diagrams then the time and cost saving would be huge.

Step 1 – Understand And Simplify the Process

If you look at any infrastructure diagram, there is a process behind its creation. Ask three different network engineers to draw a network diagram and you'll probably get three different interpretations of what they thought you meant. This will happen because each will a different understanding of what is required, how the network is configured, how best to convey that in a diagram and their own understanding of Visio. The process has several steps:

1. The diagram must be clear on scope to prevent unnecessary work, while ensuring the right level of detail is provided.

2. Rather than let each engineer gather data individually, provide access to maintained inventory lists, monitoring tools and project documents which have process and ownership supporting them.

3. Provide standard company Visio templates and shapes to get consistency in symbols and diagram layout. This also saves engineer time trying to find a shape.

4. Typing, copying and pasting text and configuration data against each shape can be automated to save time and prevent mistyping. We'll cover this in the next section.

1. Purpose
2. Gather data
3. Define shapes
4. Transfer data to diagram
5. Layout
6. Add extra detail
7. Save
8. Send / publish diagram

5. Laying out the diagram to look good, positioning shapes and connecting them requires both knowledge of Visio features as well as a defined "best practice" for the company. Some diagrams, such as rack elevations are so regular that shapes could be positioned automatically, while floor plans are always unique.

6. Add extra detail to enhance understanding, such as a bounding box around devices grouped in a building. A dotted line showing where responsibilities stop, or new devices coloured red are other examples. This will always be manual in nature, so standardised diagram formats can aid immensely.

7. Where to save the diagram so it can be viewed, updated and controlled. It requires management direction so all engineers will save, in the same way, in common places. A diagram that can't be found has no value.

8. Getting the diagram to someone who needs it can be accomplished in many ways. Central file stores, Sharepoint, pdf export, or saving to the intranet all have benefits. We just need to know where and when as part of policy.

When you look at the process it is easy to see how diagrams will vary in content and format unless there is clear direction and support. Basic diagramming practice such as versioning, owners, revision dates and purpose can all be encouraged using templates and policies.
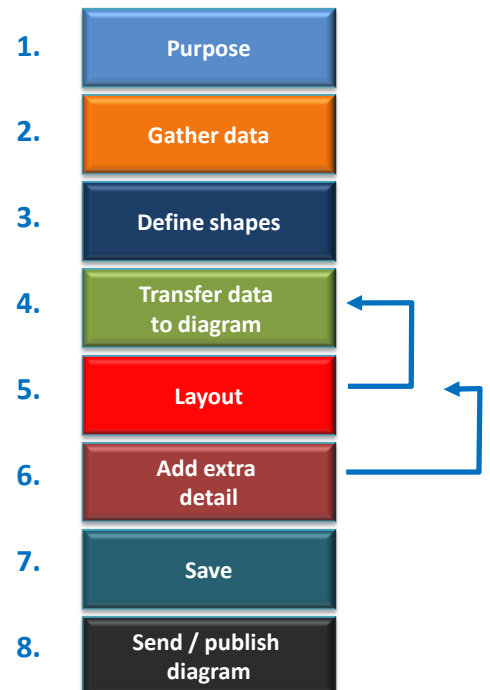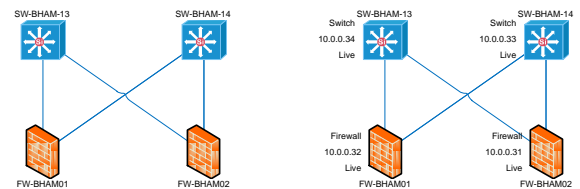
Step 2 – Automate The Process and Reduce the Number Of Diagrams

When Visio 2007 Professional was released (Jan 2007), it included two key features that enabled some of the steps above to be automated, a) linking to data sources and b) data graphics. Another little known feature is array shapes where you can draw all the floor tiles in a data centre in a few steps, cutting 30 minutes of duplicating, cutting and pasting down to a few seconds.

Linking to data sources allows Visio shapes be created and linked to Excel spreadsheets and databases, of which there is no shortage within IT teams. Update a spreadsheet and you can refresh the Visio diagram with the new IP address, model number, etc. In the diagramming process above it reduces the time for gathering data, selecting shapes and transferring data all in one go. Adding 30 routers with all their configuration details to a WAN diagram takes a few seconds, with no mistakes! Over 200 floor boxes in a spreadsheet can be added to an office floor plan in seconds. The real productivity gain is that you now have one source of data about the router which you can show in diagrams covering WAN, LAN, IP addressing, path diagrams and resilience fail over. As each diagram is linked to the same source, you can refresh configuration changes to maintain the diagram accuracy. Refreshing 100 diagrams this way may take 30 minutes, rather than manually checking every configuration parameter which would take a few days. This has been a standard feature for five years and many don't use it.

Data Graphics uses the embedded data in a shape and presents it as text, icons or colour coding, ideal for showing differences in status and configuration. In the first example on the right we are consistently positioning and displaying device status and IP address. The same graphic can be easily applied to all similar network diagrams
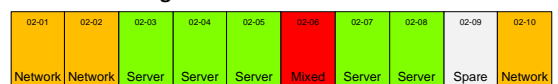
In the second example below, data graphics are being used to create different dashboard views of a row of computer room racks. Rather than maintaining four or more diagrams of the same room a single diagram can show different views by selecting a separate data graphic. We can easily see what the rack functions are, their power consumption and available space.

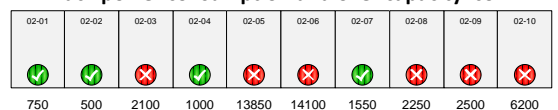In a computer hosting environment this can show which customers are in which rack, or which are exceeding contracted power delivery, or specific rows or cabinets are allocated to test, production and development equipments. Data graphics is a powerful way to reduce the numbers of diagrams and also use the power of visualisation to communicate risks and differences in configuration.

A very effective way to communicate support risks is to create application service maps of your key systems and then colour code which hardware / software components have recovery plans, which are not currently supported by vendors or are out of step with security standards.

Without Data Graphics **With Data Graphics Text**

Data Graphics Applied to Computer Racks

Without Data Graphics

02-01	02-02	02-03	02-04	02-05	02-06	02-07	02-08	02-09	02-10

Showing rack function and colour coded

02-01	02-02	02-03	02-04	02-05	02-06	02-07	02-08	02-09	02-10
Network	Network	Server	Server	Server	Mixed	Server	Server	Spare	Network

Rack power consumption and over capacity icon

02-01	02-02	02-03	02-04	02-05	02-06	02-07	02-08	02-09	02-10
✔	✔	✖	✔	✖	✖	✔	✖	✖	✖
750	500	2100	1000	13850	14100	1550	2250	2500	6200

Showing available space and colour coded

02-01	02-02	02-03	02-04	02-05	02-06	02-07	02-08	02-09	02-10
69%	13%	60%	60%	56%	69%	77%	85%	90%	69%

## Step 3- Use Visio As A Visual Reporting Tool For Large Numbers of Diagrams

Linking Visio to spreadsheets or databases isn't good enough for a corporate environment where infrastructure is changing regularly and 1000s of diagrams are needed. When there are changes in infrastructure equipment or dependencies Visio doesn't help as much as we'd like as manual layout should be avoided if possible. We need a different approach to manage on a larger scale recognising that every Visio diagram is just a view to explain some aspect of complexity. A server will typically appear in rack, domain, network and other diagrams, as well as multiple spreadsheets – possibly more than 20 diagrams as a minimum. Which spreadsheet do you use? To update which diagram?

A better technique for operational diagrams is to utilise centralised sources of data and CMDBs to maintain inventory, connectivity, position and dependencies – with Visio used to "present" views of the infrastructure. For instance, most data centre management tools and network monitoring systems use an inventory database linked to visual outputs. The AssetGen system on the right uses Visio visualisation, instead of a proprietary graphical system, as it eases portability and can suit both project and operational needs.
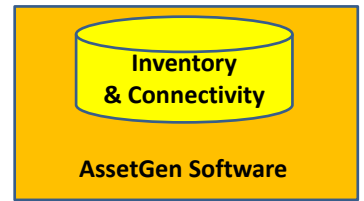
The advantages that AssetGen provides over linking Visio to spreadsheets are:

- Automated update and addition/deletion of shapes on diagrams

- Flexible filtering for LAN/WAN/SAN/power topology diagrams

- Automated layout of multiple rack diagrams

- Selection of different templates and stencils

- Other views – change impact, capacity, audit trails

- Less skill required to maintain diagrams
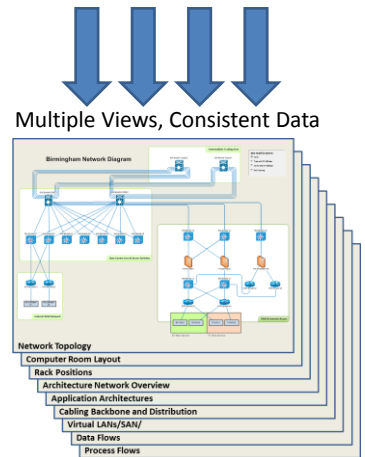
There are major advantages if you combine inventory with connectivity as this enables topology views of network, storage, voice, power, video, etc. to be produced and updated, as well as simpler views of floor plans and racks. Rather than engineers spending time drawing Visio diagrams, the diagrams are drawn as well as checked by the application, so the effort to update 1000 rack diagrams is the same as updating 10. There will still always be a need to have enhanced Visio skills to add some extra detail or re-arrange a layout, but the major work of collecting and transferring knowledge to diagrams is minimised.

Summary

While Visio is commonly utilised for planning and operational views of IT infrastructure, it is rarely used to full advantage due to lack of awareness and understanding. A map is often better than a list when explaining complexity – so it's worth investigating some of the techniques discussed to reduce the times to create and maintain the large numbers of diagrams typically required for managing network infrastructure. Maybe it's time to buy a book, attend a Visio training course or take advantage of the skills of a specialist…

The Author

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