



Chapter 2 - Troubleshooting Processes for Complex Enterprise Networks Objectives



- Describe troubleshooting methods.
- Describe the troubleshooting process.
- Select appropriate troubleshooting method for a given situation.
- Explain the factors involved in incorporating troubleshooting into routine maintenance.



Troubleshooting Methodologies

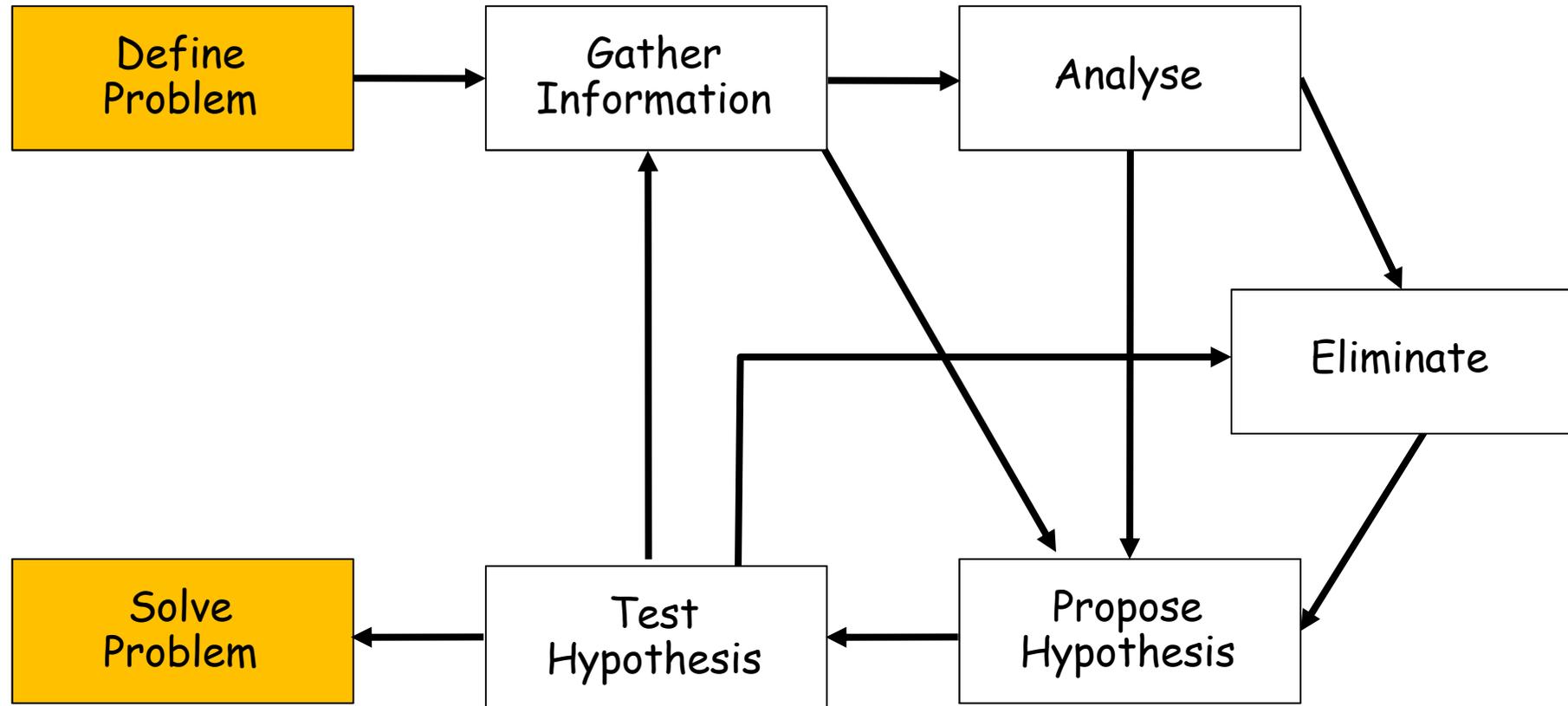


- Troubleshooting is not an exact science, and a particular problem can be diagnosed and sometimes even solved in many different ways.
- However, when you perform structured troubleshooting, you make continuous progress, and usually solve the problems faster than it would take using an ad hoc approach.

Note that the solution to a network problem cannot always be readily implemented and an interim workaround might have to be proposed.

The difference between a solution and a workaround is that a solution resolves the root cause of the problem, whereas a workaround only alleviates the symptoms of the problem.

Structured Troubleshooting Approach



- All troubleshooting methods include the elements of gathering and analysing information, eliminating possible causes, and formulating and testing hypotheses.
- Each of these steps has its merits and requires some time and effort; how and when one moves from one step to the next is a key factor in the success level of a troubleshooting exercise.



Troubleshooting Approaches

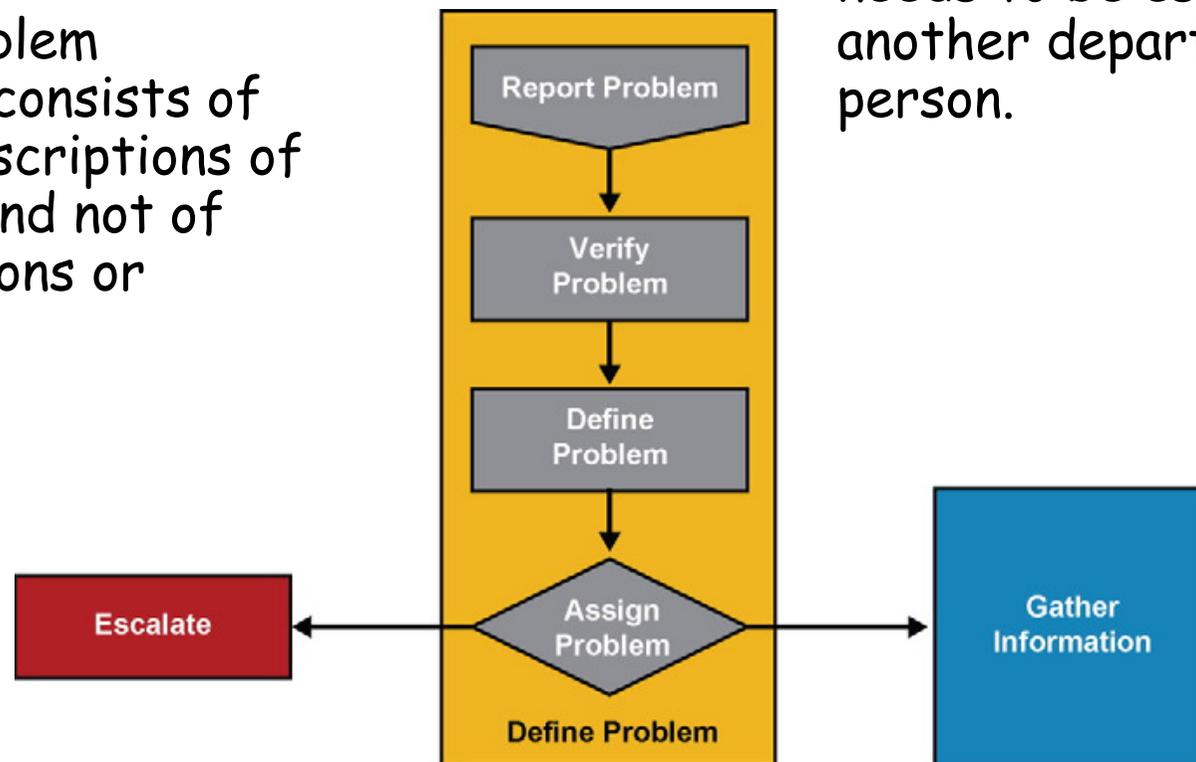
- The key to all structured troubleshooting methods is systematic elimination of hypothetical causes and narrowing down on the possible causes.
- If at some point you decide to seek help or hand the task over to someone else, your findings can be of help to that person and your efforts are not wasted.
- Commonly used troubleshooting approaches include the following:
 1. Top down
 2. Bottom up
 3. Divide and conquer
 4. Follow the path
 5. Spot the difference
 6. Move the problem
 7. Shoot from the hip

Define the Problem

- Unless an organization has a strict policy on how problems are reported, the reported problem can unfortunately be vague or even misleading.

- A good problem description consists of accurate descriptions of symptoms and not of interpretations or conclusions.

- Determine whether this problem is your responsibility or if it needs to be escalated to another department or person.

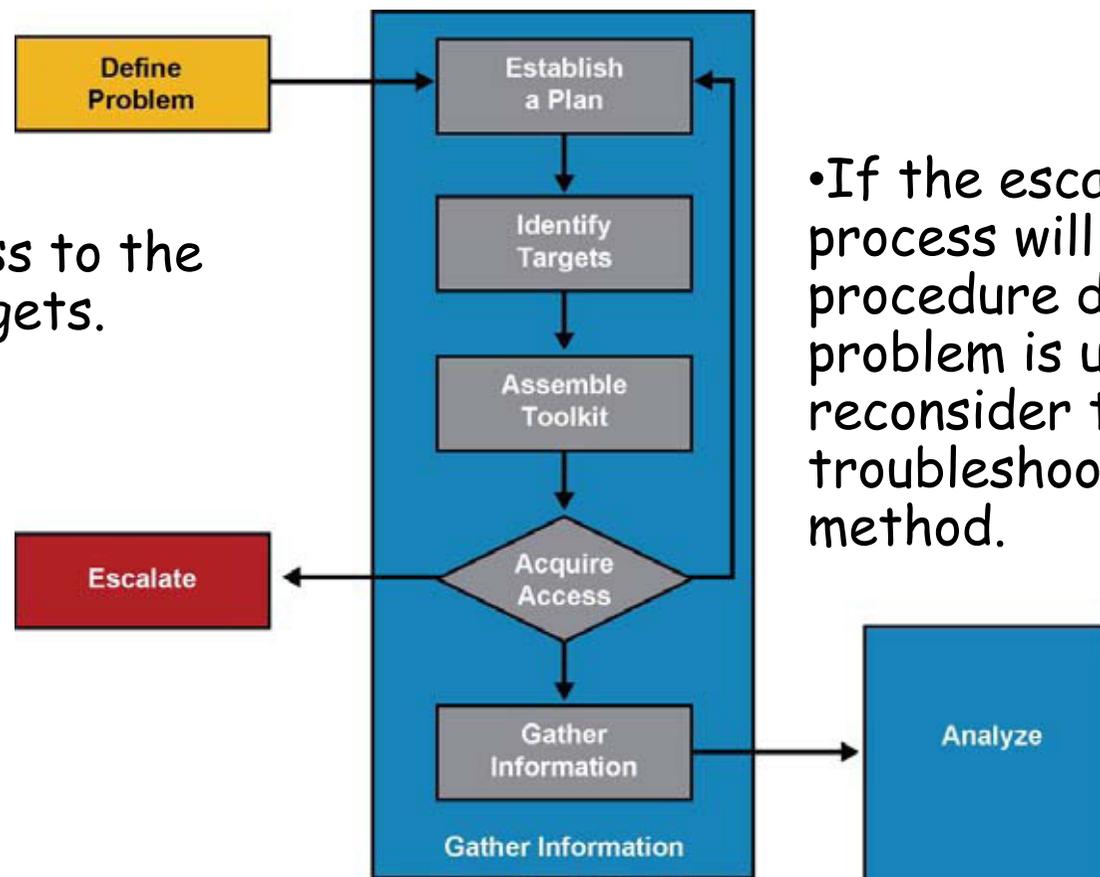


Gather & Analyse Information

- Decide which devices, clients, or servers you want to collect information from, and what tools you intend to use to gather that information .

- Escalate the issue to a different department or person to obtain access if required.

- Acquire access to the identified targets.



- If the escalation process will slow the procedure down and the problem is urgent, reconsider the troubleshooting method.

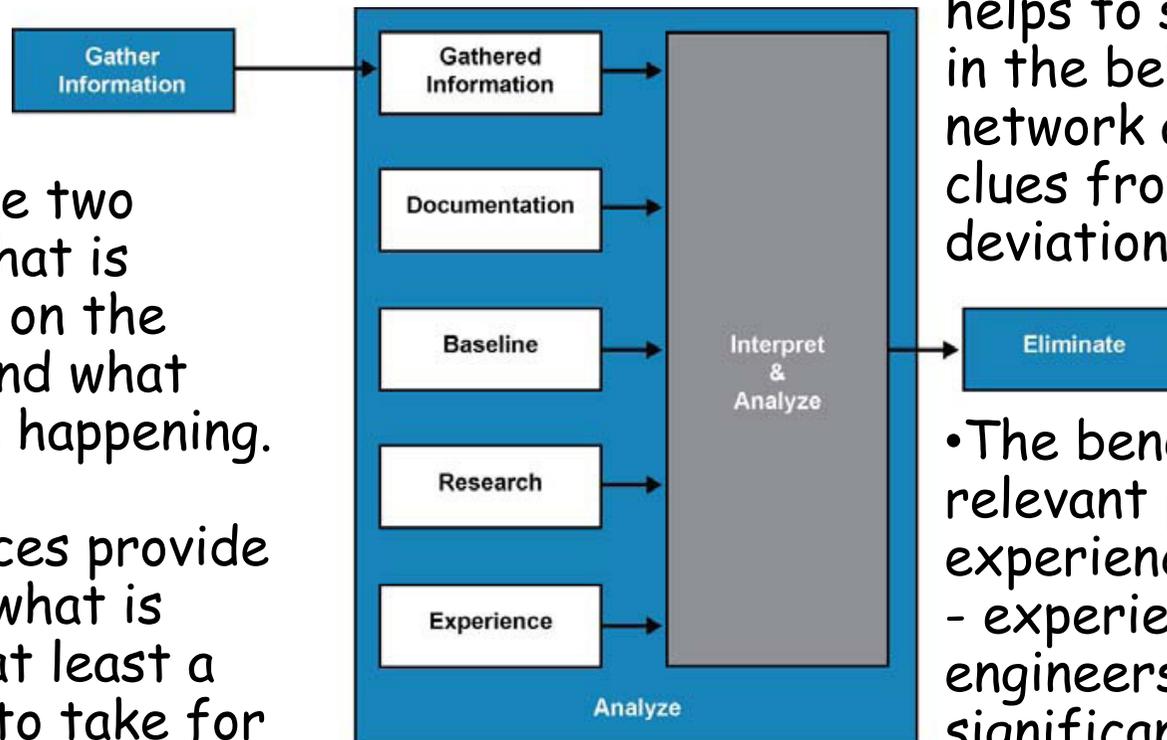
Eliminating Possible Causes

- Consult network documentation to interpret the information in the context of the actual network's implementation.

- A good baseline of the behaviour of the network can assist at the analysis stage - helps to spot anomalies in the behavior of the network and derive clues from those deviations

- Determine two things: What is happening on the network and what should be happening.

- Differences provide clues for what is wrong or at least a direction to take for further information gathering.

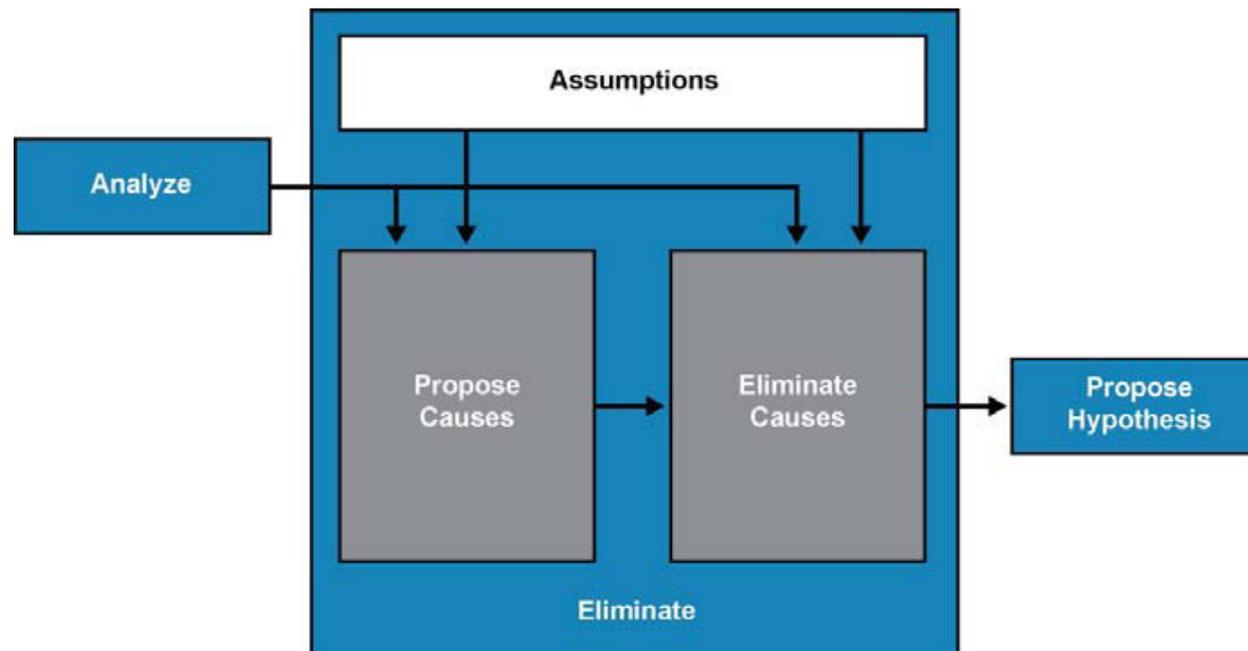


- The benefit of relevant past experience is important - experienced network engineers will spend significantly less time on researching than an inexperienced engineer

Hypothesis Testing

- Although the elimination process seems to be a rational, scientific procedure, be aware that assumptions play a role in this process, too, and you have to be willing to go back and re-examine and verify your assumptions.

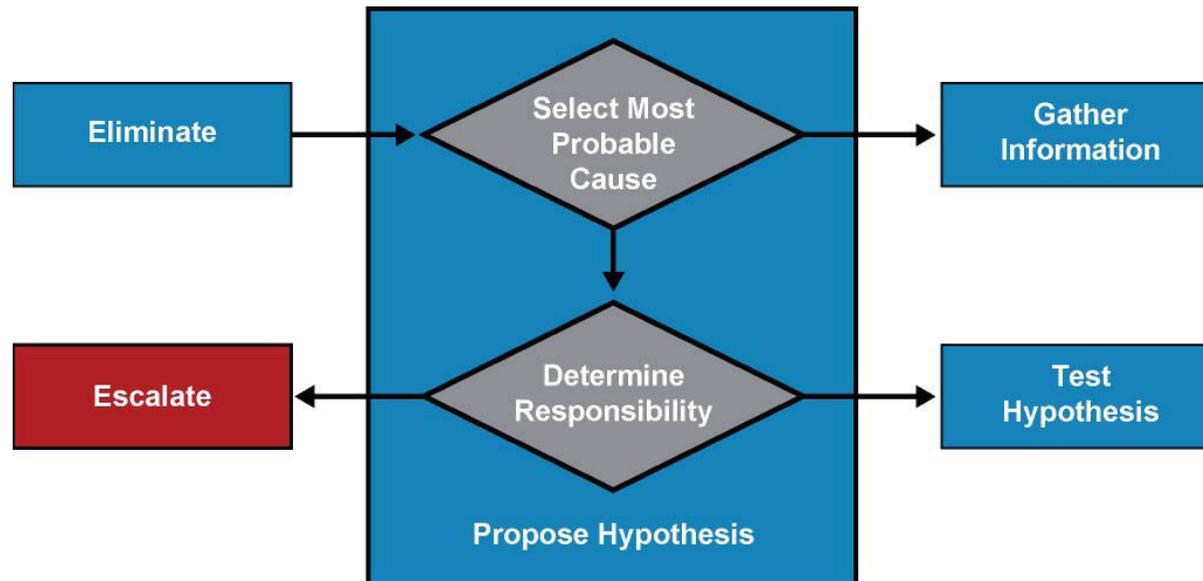
- Failure to do so may mistakenly eliminate the actual root cause of a problem as a non-probable cause, thus delaying the troubleshooting process.



Solving The Problem - 1

- Before starting to test the proposal, reassess whether the proposed problem cause is within your area of responsibilities.

- If the problem needs to be escalated, does this end your involvement in the process?



- Is there a need for a workaround? This temporary fix alleviates the symptoms experienced by the user, even if it does not address the root cause of the problem.

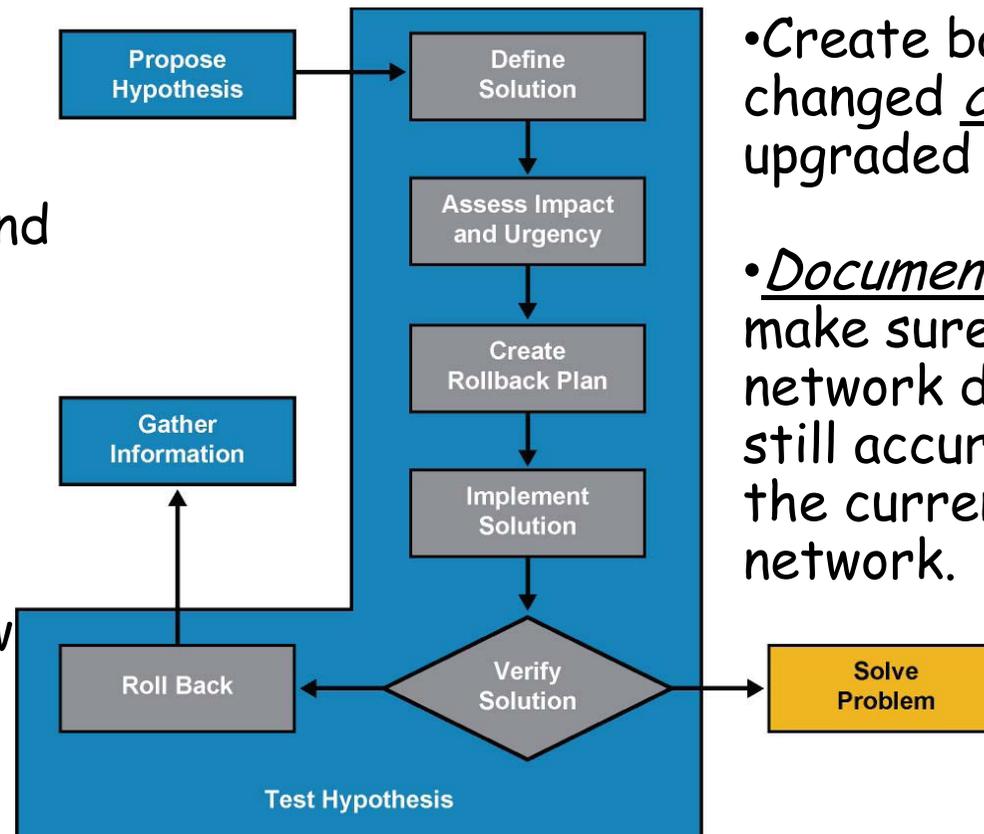
Solving The Problem - 2

- Implementing a possible solution involves making changes to the network - follow your organisation's regular change procedures.

- Assess the impact of the change on the network and balance that against the urgency of the problem - can you revert back if it all goes horribly wrong?

- Verify that the problem is solved and that the changes made did what you expected it to do.

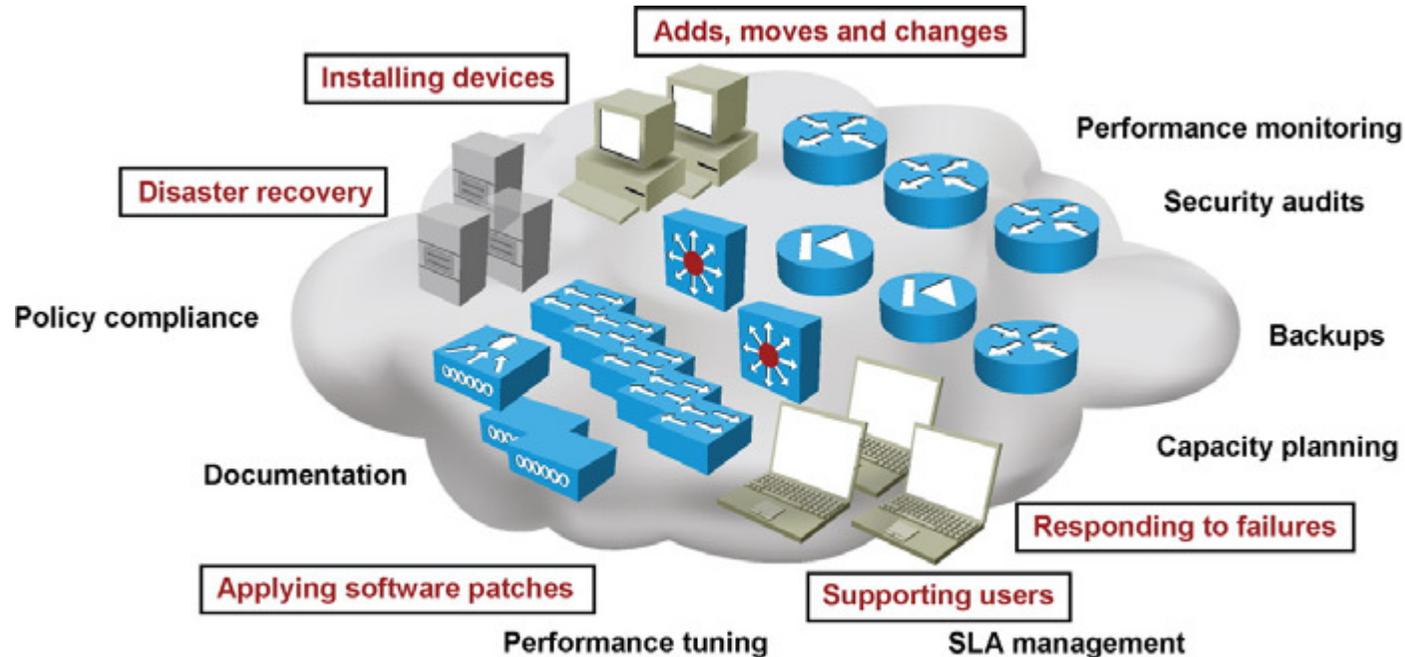
- Check that the solution has not introduced any new problems.



- Create backups of any changed configurations or upgraded software.

- Document all changes to make sure that the network documentation still accurately describes the current state of the network.

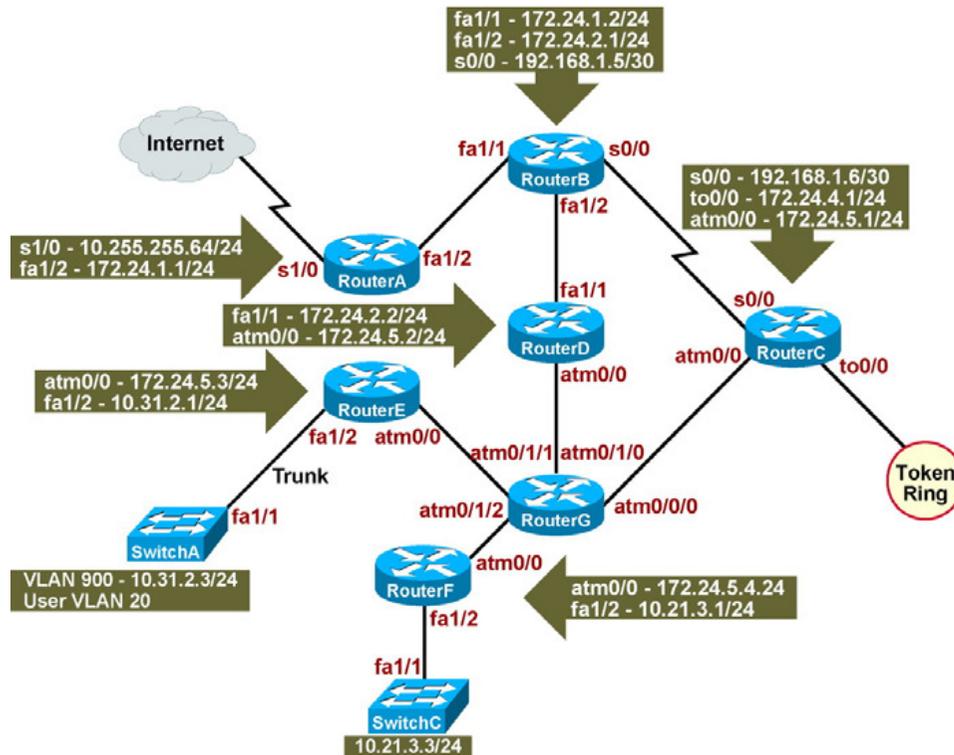
Troubleshooting & Network Maintenance



• Tasks that do not revolve around fault management, such as adding or replacing equipment, moving servers and users, and performing software upgrades, will regularly include troubleshooting processes.

• Hence, troubleshooting should not be seen as a standalone process, but as an essential skill that plays an important role in many different types of network maintenance tasks.

Network Documentation



- Having accurate and current network documentation can tremendously increase the speed and effectiveness of troubleshooting processes.

- On the other hand, documentation that is wrong or outdated is often worse than having no documentation at all.

- After a problem has been solved or a workaround has been implemented always go through any of the standard administrative processes for updating the documentation.

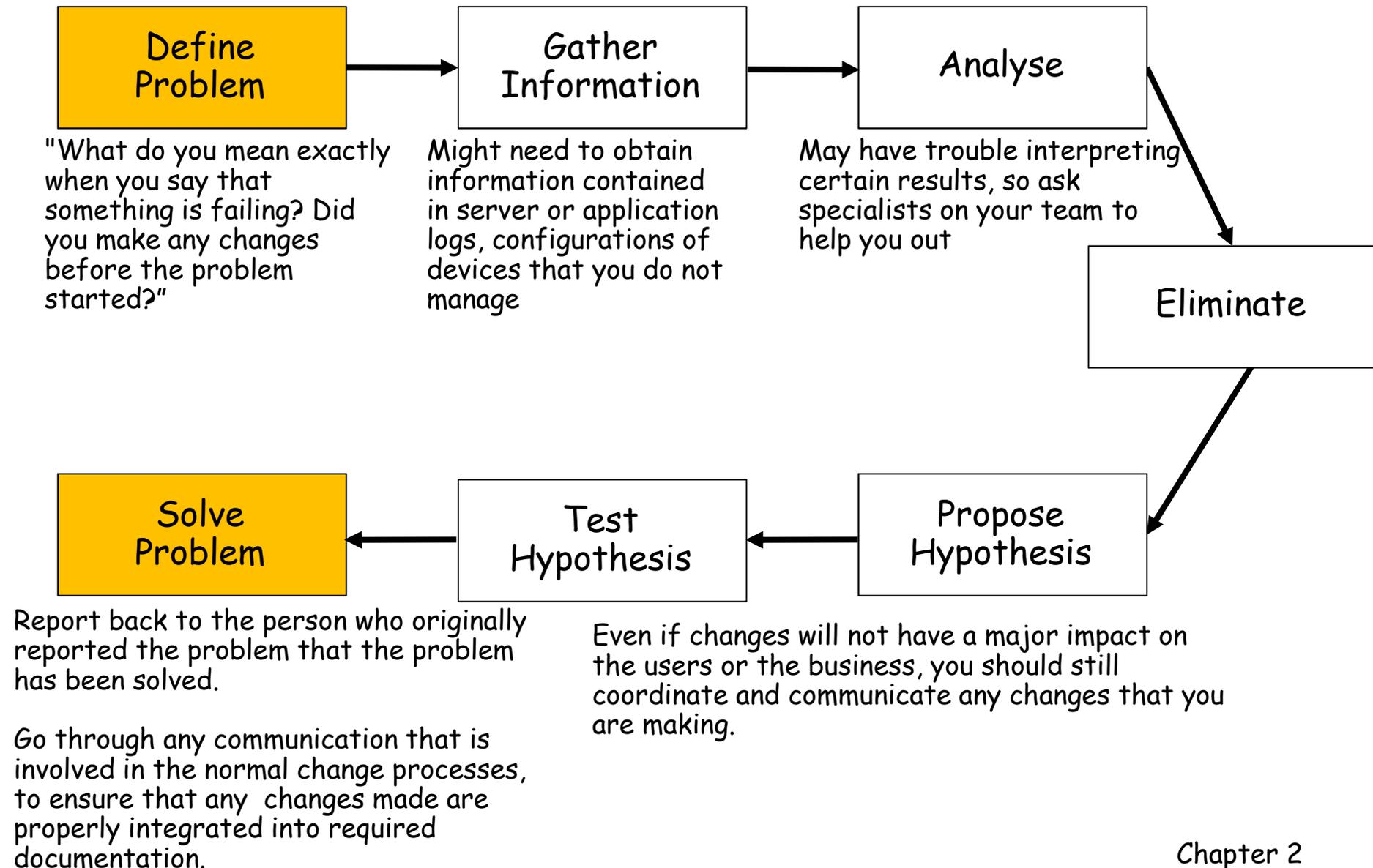
- To assist this process, maintain a log of the changes made while troubleshooting.



Creating a Baseline

- The following list describes some useful data to gather and create a baseline:
 1. Basic performance statistics such as the interface load for critical network links and the CPU load and memory usage of routers and switches: These values can be polled and collected on a regular basis using SNMP and graphed for visual inspection.
 2. Accounting of network traffic: Remote Monitoring (RMON), Network Based Application Recognition (NBAR), or NetFlow statistics can be used to profile different types of traffic on the network.
 3. Measurements of network performance characteristics: The IP SLA feature in Cisco IOS can be used to measure critical performance indicators such as delay and jitter across the network infrastructure.
- These baseline measurements are useful for troubleshooting, but they are also useful inputs for capacity planning, network usage accounting, and SLA monitoring.

Communication



Change Control

- Change control is one of the most fundamental processes in network maintenance.
- By strictly controlling when changes are made, defining what type of authorization is required and what actions need to be taken as part of that process, the frequency and duration of unplanned outages can be reduced, increasing uptime.
- The biggest difference between regular changes and emergency changes is the authorisation required to make a change and the scheduling of the change.
- Within change-control procedures, there is always an aspect of balancing urgency, necessity, impact, and risk - change now or schedule for later?



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Any
Questions?