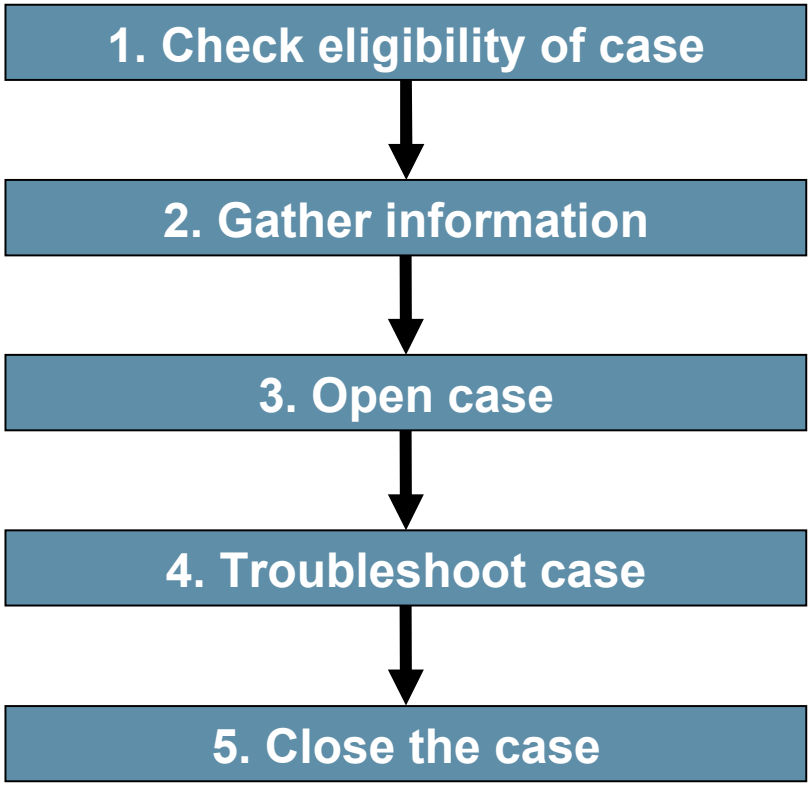
Module 5: The Methodology of Performance Issue Investigation

GÉANT2

CASE MANAGEMENT METHODOLOGY - OVERVIEW



CHECK ELIGIBILITY OF CASE

You should only open a PERT case where:

- A network application is not performing as expected

And

- The problem is suspected to be caused directly or indirectly by the network

And

- The problem is not obviously the result of specific hardware failure
  - If it is, the NOC should be contacted

GATHER INFORMATION (1)

The information you gather is categorised as follows:

- Must have
  - Information the user must provide before the investigation begins.
- Should have
  - Information you should try to get from the user for a quick resolution.
- May have
  - In certain cases, information you should try to get from the user for a quick resolution.
- Ideally have
  - The user may not be able to easily provide this information, but it will help if they can.

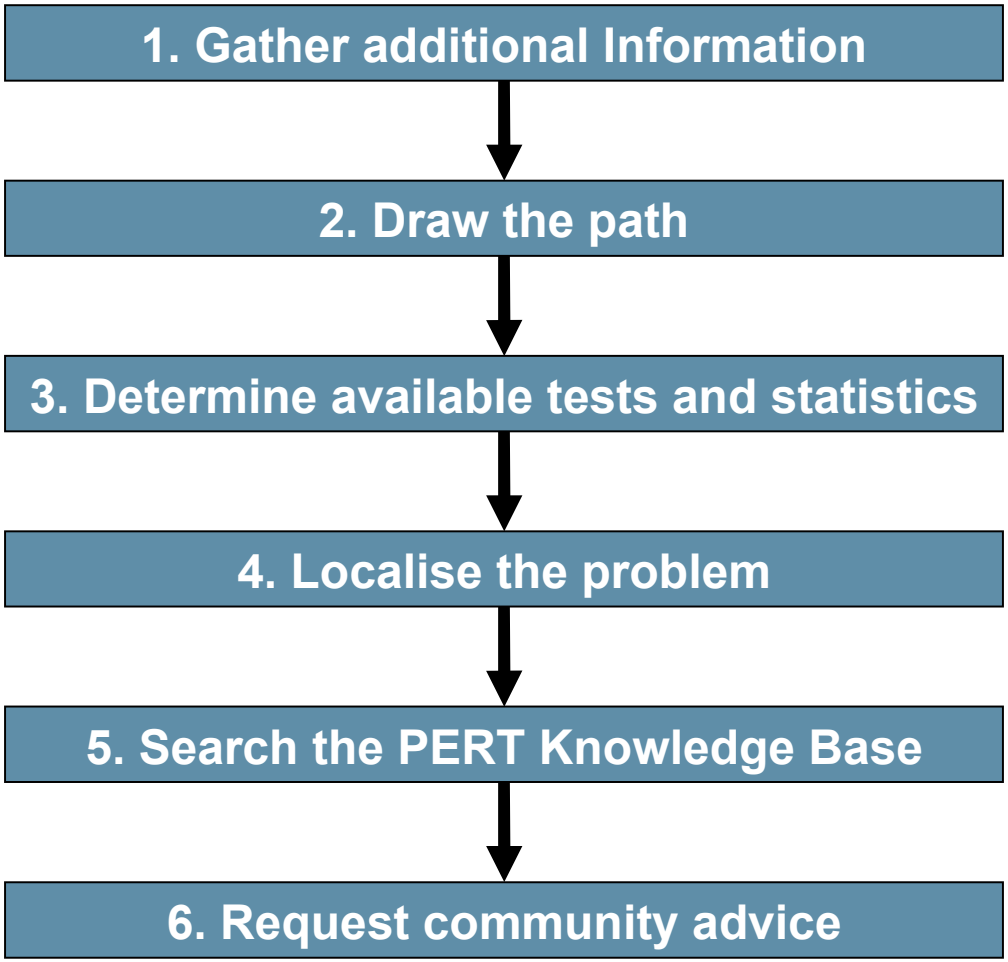
GATHER INFORMATION (2)

Problem description	Description of the current system behaviour	Must have
User's expectations	User's expectations as to how the system should behave (preferably a quantitative expectation, but a qualitative description is acceptable)	Must have
Previous behaviour	Has the system ever behaved as expected?	Should have
Start of the problem	When was the problem discovered?	Should have
Customer (user) contact	Requestor's e-mail address	Must have
A end IP address		Must have
B end IP address		Should have
A end URL		May have
B end URL		May have

GATHER INFORMATION (3)

Traffic type	IP Protocol, source port, destination port	Must have
A end user details	Details of the A-end technical POC	Must have
B end user details		Should have
Forward trace route	From A end to B end	Should have
Reverse trace route	From B end to A end	Ideally have
Round Trip Time	Only required if no trace-routes provided	Must have
A end topology	Local network equipment and connections	Should have
B end topology	Local network equipment and connections	Ideally have
A-end host details	Hardware, OS, application	Should have
B-end host details	Hardware, OS, application	Ideally have

TROUBLESHOOT CASE – OVERVIEW



TROUBLESHOOT CASE (1)

Gather additional information:

- Ask for missing information and error messages.
- Gather traceroute information.
  - *Tech tip: use 'Layer 4 Traceroute' to detect firewall filter issues.*
- Determine which networks the path traverses.
- Add contact details for each technical POC along the path to the ticket.
- Determine end-users' security policies.
  - Will / how will PERT be granted end-system access?

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TROUBLESHOOT CASE (2)

Gather additional information (continued):

- *Tech tip: if TCP is being used:*
  - *Find the send and receive socket buffers.*
  - *Calculate path's bandwidth-delay product (BDP).*
  - *Check that advertised TCP window is at least equal to the path's BDP.*
- Use information gathered to make a clear problem statement:
  - Describe symptoms.
  - Identify what would constitute a reasonable performance level.

TROUBLESHOOT CASE (3)

Draw the path:

- Contact network administrators along the path.
  - Start with the affected NRENs.
- Draw diagram of the end-to-end path, showing:
  - Equipment.
  - Connections.
- Save diagram as an attachment to the ticket, mark as important.
- *Tech tip: identify any cross traffic.*
  - *E.g. LAN switch that has heavy local traffic.*
- Update your problem statement with any possible causes (e.g. capacity bottleneck).

TROUBLESHOOT CASE (4)

Determine available tests and statistics:

- Statistics at or near the end-points.
  - `netstat -s` output, MRTG/Cricket graphs, etc.
- Packet traces (Wireshark/tcpdump/snoop).
  - Preferably from both endpoints from the same transaction/transfer.
  - Make sure hosts are synchronised via NTP or similar!

TROUBLESHOOT CASE (5)

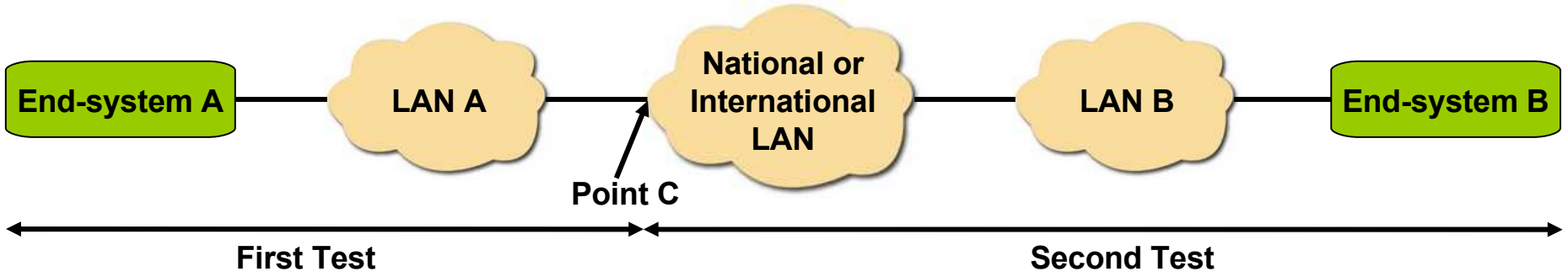
Determine available tests and statistics (continued):

- If problem is low achievable data rate, then:
  - Perform standard test to determine end-to-end transfer speeds.
    - Use the actual end-system if possible.
    - Use another end-system on the same subnet if not possible.
  - Use pre-configured Measurement Points (MP) along the path to study network performance at time of problem.

TROUBLESHOOT CASE (6)

Localise the problem:

- A typical end-to-end path may be as follows:

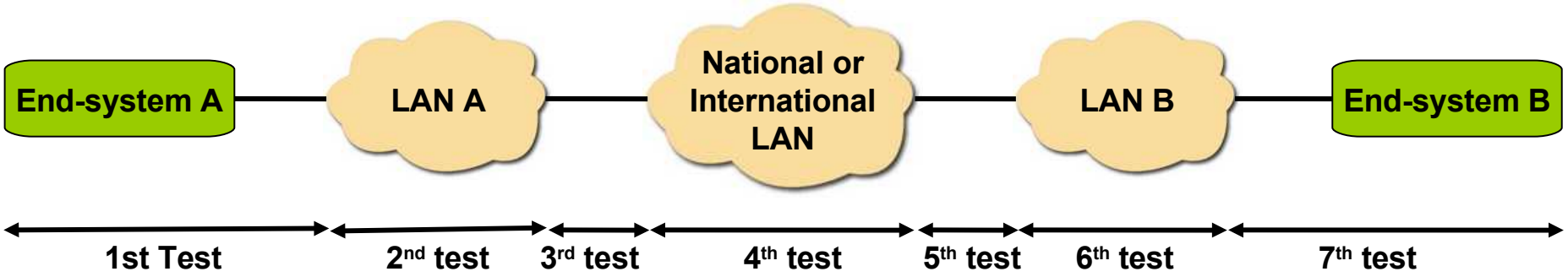


- Run two tests:
  - One from end-system A to a ‘mid-point’ (point C).
  - Another from end-system B to the ‘mid-point’.
- If one of the tests fails, find a new mid-point in its path and repeat the process.
  - Continued on next slide

TROUBLESHOOT CASE (7)

Localise the problem (Continued):

- In reality, you may not be able to run a test to / from point C.
- An alternative is to run a sequence of smaller tests, progressing along the path from one end-system to the other.



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TROUBLESHOOT CASE (8)

Localise the problem (continued):

- Testing should allow you to locate the bottleneck:
  - End-system application.
  - End-system (non-application).
  - LAN system.
  - WAN system.
- If possible, the case manager should identify a particular network element as the *dominating bottleneck.*

TROUBLESHOOT CASE (9)

Search the PERT Knowledge Base:

- Search against the category of problem or the particular network element that is suspected as the bottleneck.
- PERT Knowledge Base should help to solve many cases.

TROUBLESHOOT CASE (10)

Request assistance from the community:

- Check list of current Subject Matter Experts.
- Consult their profiles.
- Determine who to consult.

Their knowledge should help you to solve or progress the case.

Or: throw the case before pert-discuss@geant2.net.

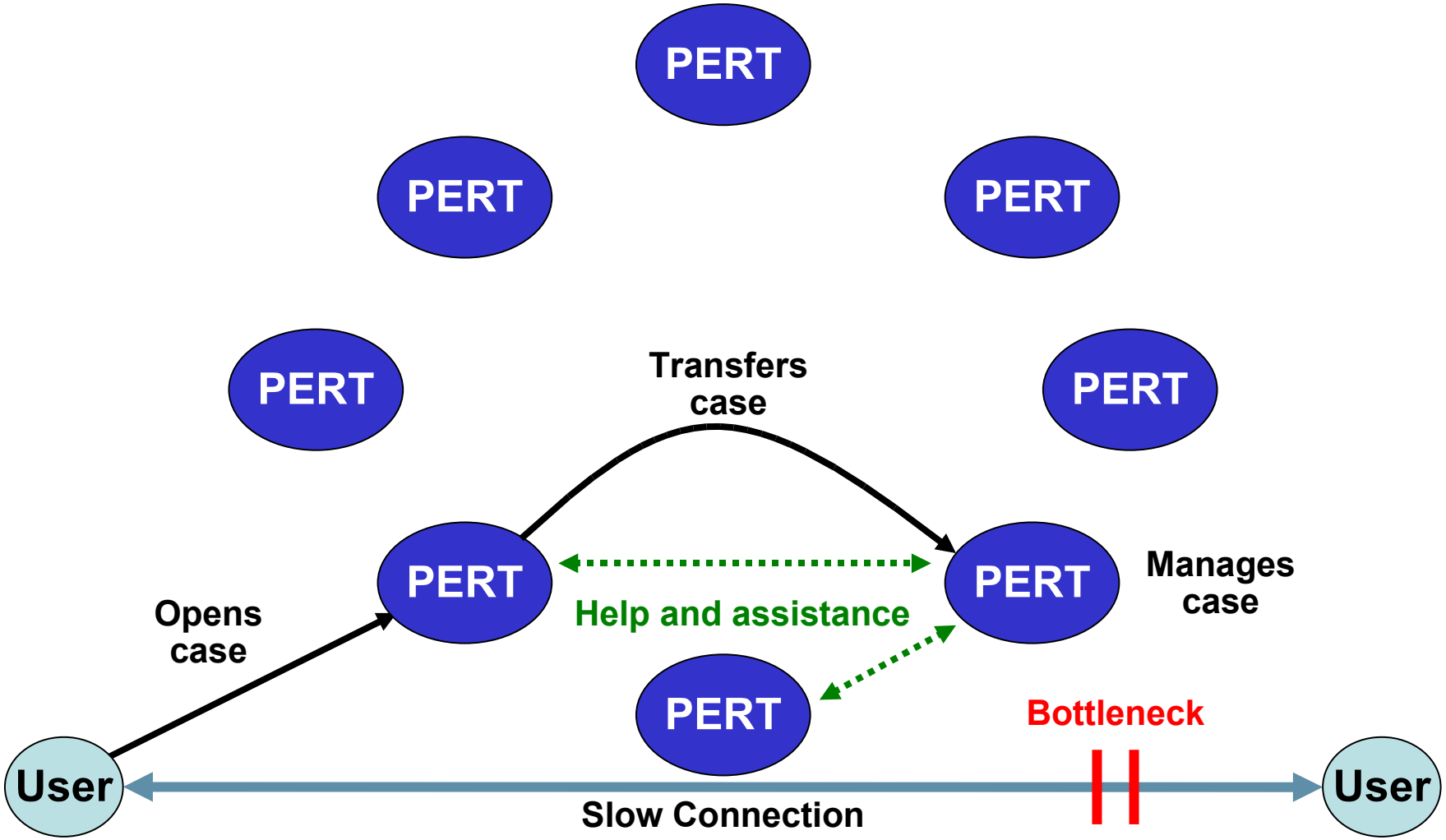
- Including a *readable* and *sufficiently complete* description.

TROUBLESHOOT CASE (11)

How to ask for remote login to PERT user's end host:

- PERT users will agree to this more often than people think!
- Build trust:
  - Provide good initial analysis and justify additional measurements.
  - Explain what you want to do on their machine.
  - Provide your (group's) SSH public key.
  - Specify (small) range of IP addresses you will log in from.
  - Tell them how long you might need this.
    - and inform them when you're actually done (they might keep your account around).
  - Offer access to one of your test machines in return.

TRANSFERRING AND MANAGING CASES



TRANSFERRING PERT CASES

A PERT needs to decide whether or not to transfer a case to another PERT:

- Directly after the basic case information is collected.
- At appropriate points during the investigation.

The decision will depend upon:

- The scope and nature of the issue.
  - Examples: single or multi-domain, straight-forward or complicated.
- The resource available.

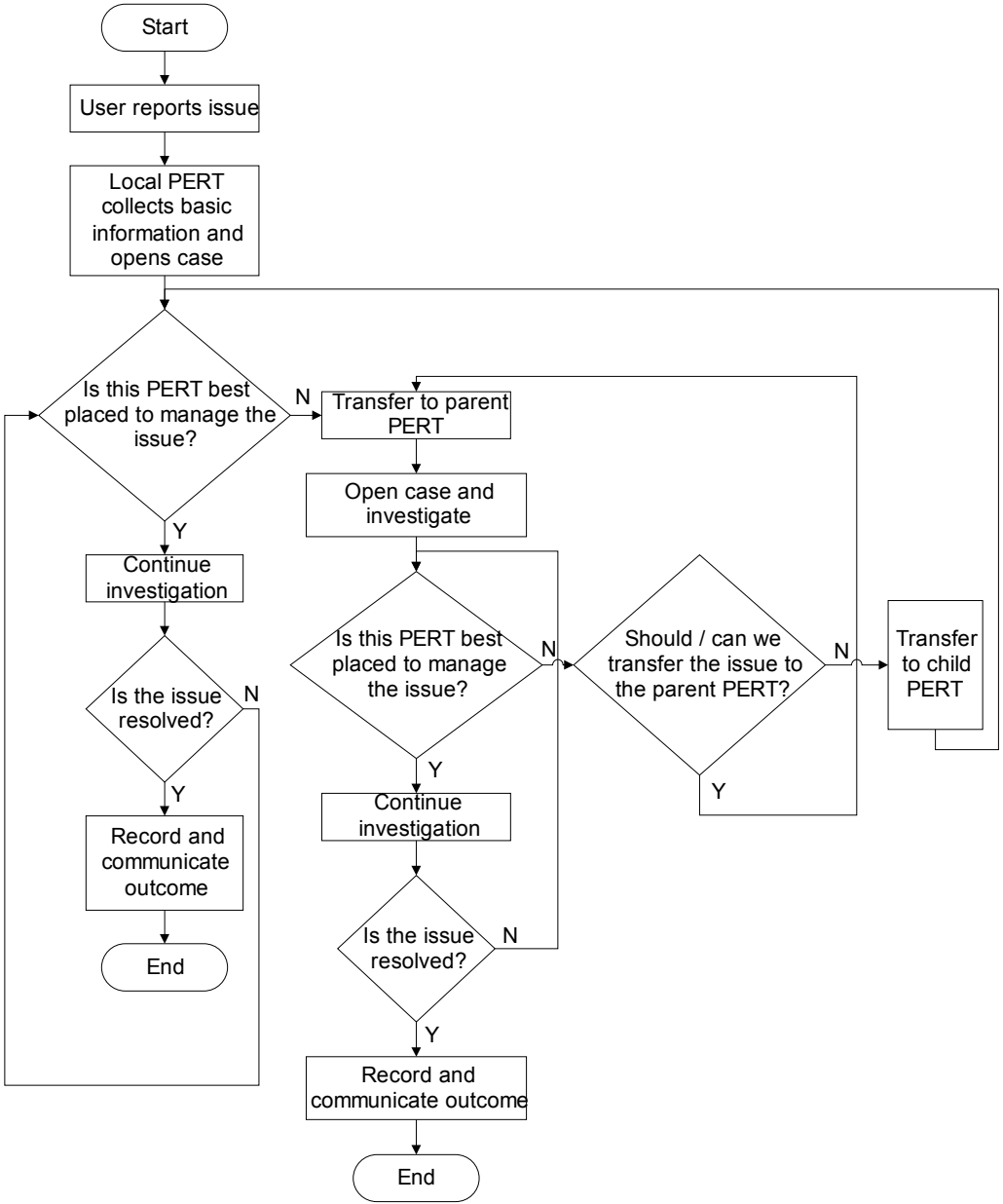
CASE MANAGEMENT AND INVESTIGATION

When a PERT case is transferred, a better-placed PERT becomes responsible for managing the case to resolution.

A PERT can also ask another PERT to assist in investigating a case without transferring management responsibilities.

- Example: information is needed relating to a specific domain or a specialised subject.

FEDERATED PERT WORKFLOW



CLOSE THE CASE (1)

Propose a resolution:

- Communicate with PERT user and intermediate contacts.
- Test solution:
  - Ensure you minimise risk of impact on other network users.
  - Ensure that you avoid security lapses.
  - If proposal requires multiple changes, try to manipulate only one variable at a time.
  - Ensure that you can roll-back if necessary.
- Implement and verify solution:
  - Re-run original tests.
  - Asks end-user to verify performance.

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CLOSE THE CASE (2)

Finalising resolution:

- Once issue is solved and / or reason for problem is understood, case manager should:
  - Contact end-user and pass on findings.
  - Create a resolution description.
  - Mark the case as ‘Resolution Proposed’.
  - Grade the case in terms of:
    - Customer’s satisfaction.
    - Problem Understanding.

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CLOSE THE CASE (3)

Finalising resolution (continued):

- Customer's satisfaction – possible categorisations:
  - Not at all satisfied.
  - Not satisfied.
  - Neutral.
  - Satisfied.
  - Very satisfied.

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CLOSE THE CASE (4)

Finalising resolution (continued):

- Problem understanding – possible categorisation:
  - Fully understood (fix identified).
  - Well understood (no fix identified).
  - Somewhat understood.
  - Incomprehensible (but possible to estimate where the problem might be).
  - Completely incomprehensible (impossible to estimate where the problem might be).

CLOSE THE CASE (5)

Add a Knowledge Base article for the issue:

- Or update an article if it already exists.
- Cross-reference the ticket.
- Include details of any tools used and how successful / helpful these tools were.

CLOSE THE CASE (6)

Once the end-user is satisfied with the case result and the Knowledge Base article has been written, then you should change the ticket status to ‘closed’.