

Module 5: Methodology

You should accept cases where

- A network application is not performing as expected (even when the symptom for the user is a total outage), and the problem has already been looked at by local support
- User wants to do something unusual and wonders whether it's plausible and/or how to do it (excellent opportunity)

Possible reasons for non-acceptance

- The issue is clearly in an end-user's domain (e.g. campus), and local support options haven't been exhausted yet
- The issue is clearly due to a temporary outage that is best handled by another team, such as a NOC.

WHO CAN RAISE ISSUES?



You should accept cases from

- Established contacts
- Other PERTs that provide good-enough reasons why your PERT is in a better position and should take over.

You *can* accept cases from

- End users who failed to get a complex issue resolved locally

...but be careful to keep their local support teams in the loop, unless/until they clearly express their non-interest.

HOW SHOULD CUSTOMERS REACH YOU?



You should provide e-mail and phone entry points

- `pert@...` is customary
- For use by other PERTs, for internal use
- Possibly for use by support groups within the organisations (see below) and maybe even end users.

Whether you *advertise* these entry points is another question

- May prefer to keep it hidden behind `noc@...` or another kind of “single point of contact”.

This is mostly an internal matter of your organisation

DON'T BE DEFENSIVE!



When doing PERT work, remember *you're not the NOC!* (not at that moment!)

- Avoid the temptation to defend **your** part of the network
- Show the client that you're on **their** side
- Even if the problem turns out to be in your network, this strategy will make you look good (or at least not as bad)

This attitude can be difficult to accept – both for the people doing the work and for their management

Documentation is important as you go along

- To get *and keep* a grasp of the system
- To be able to pull in additional help and get them up to speed
- To show the customer
 - *What the status is*
 - *That something is happening*
- For posterity – for others to learn (PERTs, users etc.)

Choose the right tool(s) for you

- Adapt an existing trouble ticket/incident tracking system
- Use a Wiki (hopefully not too well protected behind firewalls)
- Use a shared document editor with versioning, such as Google Wave or Docs?

Keep it simple (but not *too* simple 😊)

This is an open issue, we're interested in your experience!

When closing a case:

- Add a Knowledge Base article for the issue:
- Or update an article if it already exists.
- Cross-reference the ticket (if you have a public ticket system)
- Include details of tools and approaches used and how successful / helpful these were.

GATHER INFORMATION (1)



| | | |
|-------------------------|---|-------------|
| 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 (2)



| | | |
|---------------------|--|--------------|
| 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 |

- 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?*
 - *Continued on next slide*

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.*

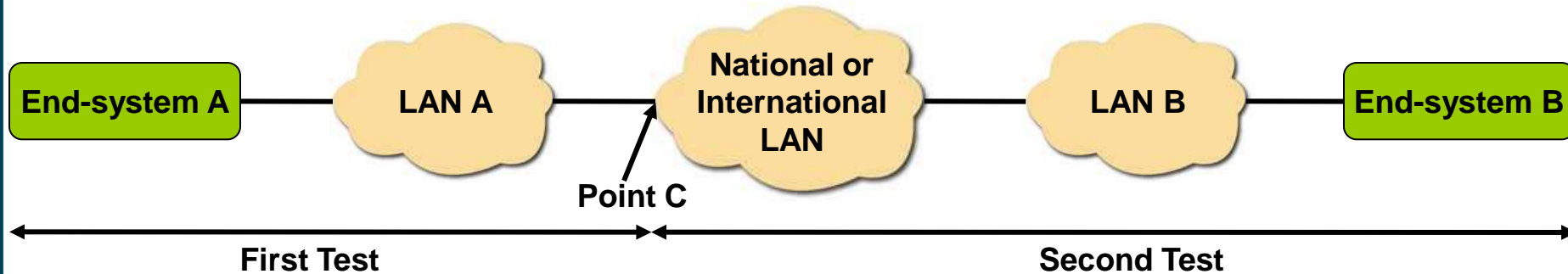
DRAW A PATH DIAGRAM



- 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).

“SPLITTING THE PATH”

To localise a problem spot along a path:



- 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.
- Doesn't always work ☹️

In difficult cases, leverage PERT community:

- Locate and contact a subject matter expert
 - *E.g. a PERT KB contributor in a relevant area*

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

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

- Including a readable and sufficiently complete description.

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.*

Consider closing a case when

- The understanding is good enough to suggest practical solutions
 - *Even if you don't understand **everything** yet*
 - *Ideally a solution has been successfully tried*
- The client has lost interest
- No progress is in sight
 - *But not if that's your fault: In that case, invest more effort*

CLOSING CASES: EVALUATE SUCCESS



“Success” can be measured on at least two dimensions:

- Do understand what the problem is/was?
- Has the situation improved?

These are less related than you think!

The most important thing:

- Is the customer satisfied?

They might be, even in cases where performance is still bad!

Module 6: eduPERT

Concept invented during brainstorm between Internet2 and European NRENs.

- Support structure for end-to-end performance issues.
- Equivalent to Computer Emergency Response Team (CERT):
 - *Both span multiple domains.*
 - *No one organisation owns either problem.*

WHAT DOES A PERT DO? (1)



Help network users obtain optimal performance by reactively:

- Accepting problem requests
- Coordinating measurements
- Establishing contacts with other teams
- Locating bottlenecks
- Suggesting improvements.

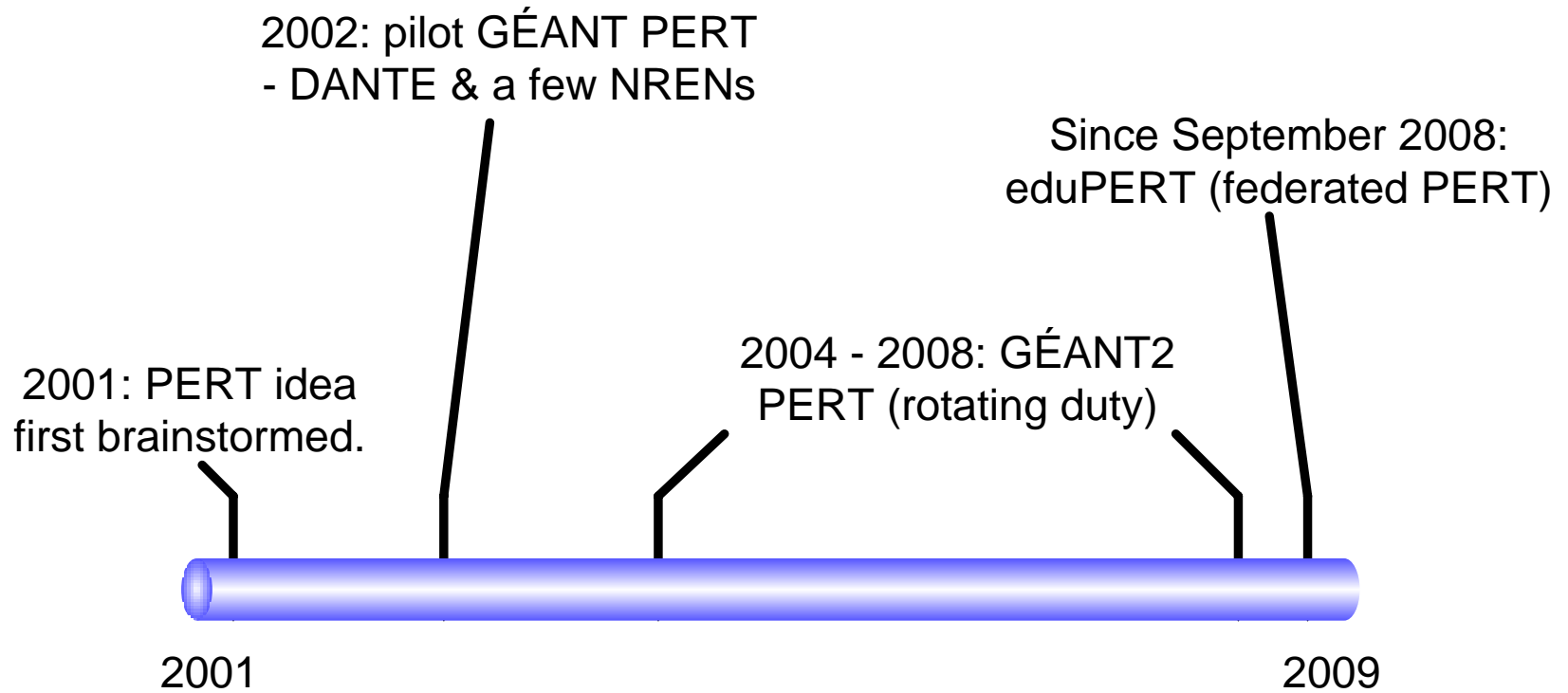
WHAT DOES A PERT DO? (2)



Help network users obtain optimal performance by proactively:

- Consulting
- Documenting
- Measuring.

TIMELINE



Ensemble of distributed PERTs (NREN, campus, large projects, GÉANT...).

Common coordination functions:

- PERT registry and accreditation: edupert.geant.net
- Forums for knowledge exchange:
 - *PERT Knowledge Base (Wiki):* kb.pert.geant.net
 - *Mailing list:* <cert-discuss@geant.net>
 - *Workshops and training events.*

PERT central services consist of:

- PERT registration
- PERT accreditation
- PERT Knowledge base
- Training / workshops.

No formal entry requirements.

Data needed:

- Organisation, PERT name, languages spoken.
- Contacts: manager, public and private entry points.

To register, mail pert-registration@geant.net or contact your closest upstream PERT.

An accredited PERT commits to a service level.

- Additional information requested:
 - *Hours of service*
 - *Response times*
 - *Service areas (AS, etc.)*
 - *Technical network information*
 - *Measurement tools that will be shared within eduPERT community generally.*
- For accreditation, contact pert-accreditation@geant.net.

Reporting is:

- Mandatory for accredited PERTs
- Encouraged for all PERTs
- Monthly:
 - *Covers no. of new, closed and ongoing cases.*
- Summarised by DANTE and included in GN2 Monthly Service Report (MSR).
- Also monthly reporting about usage of PERT Knowledge Base.

PERT KNOWLEDGE BASE (1)



The screenshot shows a web browser window with the address bar displaying `kb.pert.geant.net/PERTKB/WebHome`. The page features the **eduPERT** logo and a search bar. A navigation menu on the left includes **PERTKB Web** with sub-links for Home, Changes, Topics, Index, and Search, as well as **Welcome Register**. The main content area shows the breadcrumb `You are here: TWiki > PERTKB Web > WebHome` and a welcome message. Below this, there are sections for **Latest News** (with an [RSS Feed](#) link) and a **Table of Contents** listing various topics such as performance basics, network performance metrics, network protocols (TCP, UDP, RTP, SCTP), and application protocols (FTP, SSH, BitTorrent, GridFTP, VoIP, Videoconferencing, etc.).

<http://kb.pert.geant.net/>

Wiki-powered website.

You must register to edit content.

Wide range of topics:

- General performance concepts.
- Configuration guidance for hosts (various OS) and networks.
- Descriptions of measurement tools with examples.

More participation required from external experts (you).

Training events, such as this one.

Workshops for inter-PERT exchange of experience and best practice:

- Usually run during GÉANT-related technical events (or TNC)

COOPERATION BETWEEN PERTS



PERTs need to communicate about issues:

- Offer help to one another when necessary.

Issue ownership can transfer if appropriate.

PERT ROLES AND RESPONSIBILITIES (1)



At a minimum, the following roles are required:

- Administrator:
 - *A named person, responsible for communicating PERT contact details to parent PERT and users.*
 - *Likely to be a part-time role or on best-effort basis.*
- Technician(s):
 - *Responsible for receiving, investigating and, if necessary, escalating cases.*
 - *Part-time or full-time role or on best-effort basis.*

PERT ROLES AND RESPONSIBILITIES (2)



In addition to an administrator and technicians, NREN and Regional PERTs are strongly recommended to have:

- PERT Manager -
 - *Named individual.*
 - *Has overall responsibility for the PERT.*
 - *Point of escalation.*
 - *Part-time role.*
 - *The manager may also be the technician and / or the administrator.*
- Deputy PERT Manager -
 - *Responsible for the PERT in the manager's absence.*

SKILLS AND EXPERIENCE REQUIRED (1)



Technical group:

- Qualification and / or experience in network management
- Good knowledge of TCP/IP
- Knowledge of Ethernet and / or other relevant data-link / physical layer protocols
- Good knowledge of own network's topology, policies and configuration.

SKILLS AND EXPERIENCE REQUIRED (2)



Pert Manager / Deputy Manager:

- Managerial / supervisory skills

Administrator:

- Good communication skills
- Co-located, or in regular contact with, rest of team.

All team members:

- Competent written and spoken English.
 - *Required for national PERTs; encouraged for other PERTs.*