

10.06.08

# Deliverable DS3.12.4: Policy for a Federated Performance Enhancement Response Team (PERT)



## Deliverable DS3.12.4

Contractual Date: 30/06/08  
Actual Date: 10/06/08  
Contract Number: 511082  
Instrument type: Integrated Infrastructure Initiative (I3)  
Activity: SA3  
Work Item: WI-12  
Nature of Deliverable: O  
Dissemination Level: PU (Public)  
Lead Partner: DANTE  
Document Code: GN2-08-101

**Authors:** Toby Rodwell, Stella-Maria Thomas

## Abstract

This document specifies the purpose and responsibilities of the federated Performance Enhancement Response Team (PERT), with an emphasis on membership criteria (the minimum expected standard that a PERT must achieve in order to join the federated PERT) and the processes for inter-PERT communication.

# Table of Contents

0	Executive Summary	iv
1	Introduction	1
2	Responsibilities and Organization of the Federated PERT	3
2.1	Purpose of the PERT	3
2.2	Types of PERT	3
2.3	Central Services	4
2.4	Registration	4
2.5	Accreditation	5
2.6	Workshop Management	6
2.7	PERT Knowledge Base	6
2.8	Reporting	6
2.9	PERT Ticket System	6
3	Membership Requirements	7
3.1	Types of Membership	7
3.2	Registered Membership	7
3.2.1	Requirements for Registration	7
3.2.2	Benefits of Registration	8
3.3	Accredited Membership	8
3.3.1	Requirements for Accreditation	8
3.3.2	Benefits of Accreditation	8
3.3.3	Revocation of Accreditation	8
4	Recommended Practices	9
4.1	Working Practices	9
4.2	Knowledge Levels	9
4.3	Case Management and Ownership	10
4.4	Case Histories	11
4.5	Publicising the PERT	11
4.6	Escalation	11

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

5	Conclusions and Future Work	12
6	Acronyms	14
Appendix A	Application for Accreditation	15
Appendix B	Monthly Service Report Format	18
B.1	Section 1: PERT Reporting	18
B.1.1	Case Statistics	18
B.1.2	Notable Case Summaries	18
B.1.3	Explanatory Notes:	19
B.2	Section 2: Federated PERT Monthly Report	20
B.2.1	Summary Statistics	20
B.2.2	<Month> PERT Case Analysis	20
Appendix C	Suggested Case Management Procedure	21

## 0 Executive Summary

The purpose of a Performance Enhancement and Response Team (PERT) is to help end-users to get optimal performance from their networked applications. Typically an end-user will contact the PERT either directly or through their standard IT support channels when their applications are not working as well as they would normally do. Typical areas of concern for users are low throughput, slow response time for interactive applications and degradation (noise). To diagnose such problems a PERT must consider the properties of the complete end-to-end path, therefore one of the main functions of the PERT is to ask intelligent questions of those who have systems on that path, including end-users, system administrators, and network operators.

Although the concept of a PERT came from Internet2, the first practical implementation was done by a group of European National Research and Education Networks (NRENs) and DANTE, as part of a pilot service in the GÉANT project. The pilot was successful so a more formal, better resourced service was provided as part of GÉANT2 (GN2). The current GN2 PERT is a virtual team of NREN engineers each working part-time in order to ensure there is always someone available to investigate new requests for help. Overall the service has worked well, but has received less use than expected. It is believed the lack of use of the PERT has two causes. The existence of the PERT is not widely known outside of the GN2 consortium and most NRENs deal with any performance issues reported to them without involving the GN2 PERT.

The importance of promoting the PERT service, and of getting more organizations involved and interacting, was highlighted in the Year 3 GN2 Deliverable DS3.12.1 “Description of a Decentralized PERT” and that document recommended that the current GN2 PERT should be replaced by a federated PERT.

To encourage NRENs to join the Federated PERT the minimum requirements for entry have been set very low – all that is required is a set of public and private contact details. NRENs who provide such information are “registered” members of the PERT and their public details are displayed on the central PERT website (the private details are only visible to other PERTs). Registered NRENs are encouraged, but not obliged, to give more extensive information about themselves to help other NRENs or PERTs troubleshoot multi-domain issues.

Once registered, a PERT may apply to become “accredited”. Accredited PERTs must commit to providing a minimum level of service. In other words, they must guarantee to respond to requests for help within a self-imposed maximum time limit of no more than two working days. Accredited PERTs must also provide more extensive information about themselves and the domain for which they are responsible – in return they are guaranteed access to the equivalent information from other accredited PERTs.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

The Federated PERT is not limited to NRENs; universities and other organizations are also encouraged to join, by setting up “local” PERTs. Local PERTs must send their registration information to their NREN, who checks the validity of the information and then either adds the information to their national PERT website or forwards it to the central registration team. In the same way international projects are encouraged to set up “project” PERTs, and these organizations must send their registration information direct to the central registration team.

The central registration team is one of five teams that provide the five central services:

- The Registration Service which registers new PERTs.
- The Accreditation Service which provides application forms to PERTs seeking accreditation, and awards and, if necessary, revokes accreditation according to the agreed policy.
- The Workshop Management Service which organizes PERT meetings.
- The PERT Knowledge Base service which manages the central PERT Knowledge Base.
- The Reporting Service which compiles and submits monthly reports on PERT activity.

Depending on demand there may be a sixth service, the central PERT Ticket System (PTS), which would provide and maintain a central PERT Ticket System for those PERTs that wish to use it.

The teams that provide the central services will be provided by a variety of GN2 members, not just by the GN2 PERT. Separating the GN2 PERT from the central services helps ensure that it is not seen as a super-PERT with overall responsibility for all network performance matters – responsibility for diagnosing performance issues ultimately rests with the PERT whose customer it is who is suffering.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

# 1 Introduction

For the first twenty years of commercial computer networking the bottleneck in any given networked system was invariably caused by the data rate (colloquially known as “speed”) of one or more of the WAN circuits in the path. Whilst WAN circuits would operate in the range of 64 kilobits per second (kbps) to 2 megabits per second (Mbps), LANs were capable of data rates which were tens or even hundreds of times faster than that, and the same was true of the end-system components. The effect of this was that end users assumed (normally correctly) that any slowness in an application running over a network was due to the data rate of the interconnecting WAN. Furthermore – and less obvious to both end users and network engineers – any sub-optimal performance by other system components was entirely masked by the WAN’s very limited capabilities.

Today the difference in data rate between LANs and WANs is much reduced, and often for a given path the WAN portion has a larger capacity than the LANs at either end. This is particularly true in the case of research and academic networking, where WAN circuits are normally multi-gigabit. However, the significant increase in WAN data rates has, for many network users, not been matched by an equivalent increase in application performance. Sometimes increased network capacity has simply led to increased usage, and so the bandwidth available to individual end-systems has stayed the same. But even if the connecting networks are only lightly loaded (often the case with research and education networks) many end users find their applications transferring data at a few tens or hundreds of Mbps, despite being connected to their LAN at 1 gigabit per second (Gbps).

The reasons for this mismatch can be many and varied, but normally the problem results from a combination of factors such as large one way delay, packet loss and an old version of the Transmission Control Protocol (TCP). Diagnosing and correcting such issues is not trivial and requires a team with a wide range of knowledge and experience, as well as access to end systems, intermediate systems, and historical data relating to network conditions. Such a team is called a Performance Enhancement Response Team (PERT), a term coined by Internet2 engineers at the 2000 Joint Tech Workshop in Hawaii. However, it was a collection of European NRENs who in late 2001 actually set up the first working PERT as part of the GÉANT project. Although the GÉANT trial PERT dealt with only a small number of cases, the participating NRENs were sufficiently enthusiastic about the concept that they were willing to continue and expand the PERT for GÉANT’s successor project, GN2. Indeed, some of the founding members, most notably SWITCH, set up their own PERTs.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

The GN2 PERT has had mixed success. It has deployed and populated the PERT Knowledge Base, which has been heavily used, and those who have requested the PERT's assistance have generally been appreciative of the help they have received. However, the number of cases that have been raised with the PERT has been fewer than expected (averaging around one a month) and, more importantly, the anticipated increase in PERT cases has not taken place. There are two likely reasons for this. Firstly, the GN2 PERT (which is a virtual team of part-time members) is not widely known of outside the European NRENs and a small number of international projects. Secondly, the NRENs themselves rarely request PERT assistance as most of them investigate network performance issues themselves.

Both of these problems should be addressed by the next stage in the evolution of the PERT, namely the migration of the virtual centralised PERT to a Europe-wide federated PERT.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## 2 Responsibilities and Organization of the Federated PERT

### 2.1 Purpose of the PERT

The purpose and responsibility of each PERT, individually and collectively as a part of the federated PERT, is to help diagnose and locate the root causes of problems which actually or potentially affect the performance of network-dependent end system applications. It should be emphasised that it is not the responsibility of the PERT to fix network problems; that responsibility resides wholly with the appropriate domain's Network Operations Centre (NOC), although a PERT will often be a function embedded within an NOC, so that a PERT engineer is also an NOC engineer. Whilst PERTs are not actually responsible for the configuration and maintenance of their networks, they should of course advise NOCs on what work is required to restore or improve network performance and may also be able to recommend possible workarounds to end users. Whilst PERT engineers require an advanced level of knowledge about networking protocols (and TCP/IP in particular) the largest part of their task is identifying the organizations and people who have systems in the problematic end-to-end path and getting from these people the answers to the questions which will identify the root cause of the problem.

### 2.2 Types of PERT

From 1<sup>st</sup> September 2008 the current GN2 PERT will be succeeded by a federation of related but independent PERTs. There will be four types of PERT:

- The GN2 PERT.
- National PERTs.
- Local PERTs.
- Project PERTs.

The GN2 PERT is the responsibility of DANTE, while national PERTs remain the responsibility of the appropriate NRENS.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

**Note:** The GN2 PERT will not necessarily offer centralised PERT services. The GN2 PERT investigates problems transiting the GN2 network; however the accreditation scheme, updates of the Knowledge Base, and so forth, can be carried out by a number of organisations, not just by the GN2 PERT.

Local PERTs are PERTs established on university campuses or within other similar institutions. Project PERTs are those set up by international projects which have a centralized networking function, and for which there is no single country involved.

Most PERTs will be set up as a function of an existing group (such as an NOC), or a collection of groups (NOCs and engineering teams) rather than be a newly created dedicated team.

Each PERT should have a PERT Manager. The PERT Manager is the main administrative point of contact for that PERT, and as such does not need to be a technically skilled person. For small PERTs (two or three people) the PERT Manager does not even need to be an experienced manager.

All research and education institutions which provide network facilities are encouraged to set up a PERT. The effort required to setup and run a minimal PERT is very low and is a matter of providing a few simple contact details – this is termed “registration” (see Section 3). However, larger organizations, and those which provide transit networks such as NRENs are encouraged to seek accreditation (see Section 3.3). Accredited PERTs are required to provide more detailed information about themselves and their operations, and to make certain commitments such as guaranteeing to respond to requests within a given time frame. Accredited PERTs must make available – or provide on demand – to other accredited PERTs any relevant information which might not otherwise be publicly available such as the makes and models of their network equipment. They must also afford to other accredited PERTs specific privileges such as the ability to run extended throughput tests.

## 2.3 Central Services

The Federated PERT can be considered to be a combination of the independent PERTs (described above) and a group of central services, which are described below and also shown in Figure 2.1. Note that although the services are described as “central”, they are not provided by a single central team. Rather, each service is provided by its own team, which itself may be made up of staff from a number of NRENs and/or DANTE.

## 2.4 Registration

The registration service records the details of all new European NREN PERTs and makes the appropriate information publicly available on a centralized website. The centralized service will also record and publicise information for those national PERTs which do not run their own websites, but only if that information is supplied by the national PERT and the national PERT first checks the appropriateness of each registration request, and the validity of any details supplied. In Figure 2.1 this flow of information is represented by the broken lines connecting the various PERTs.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

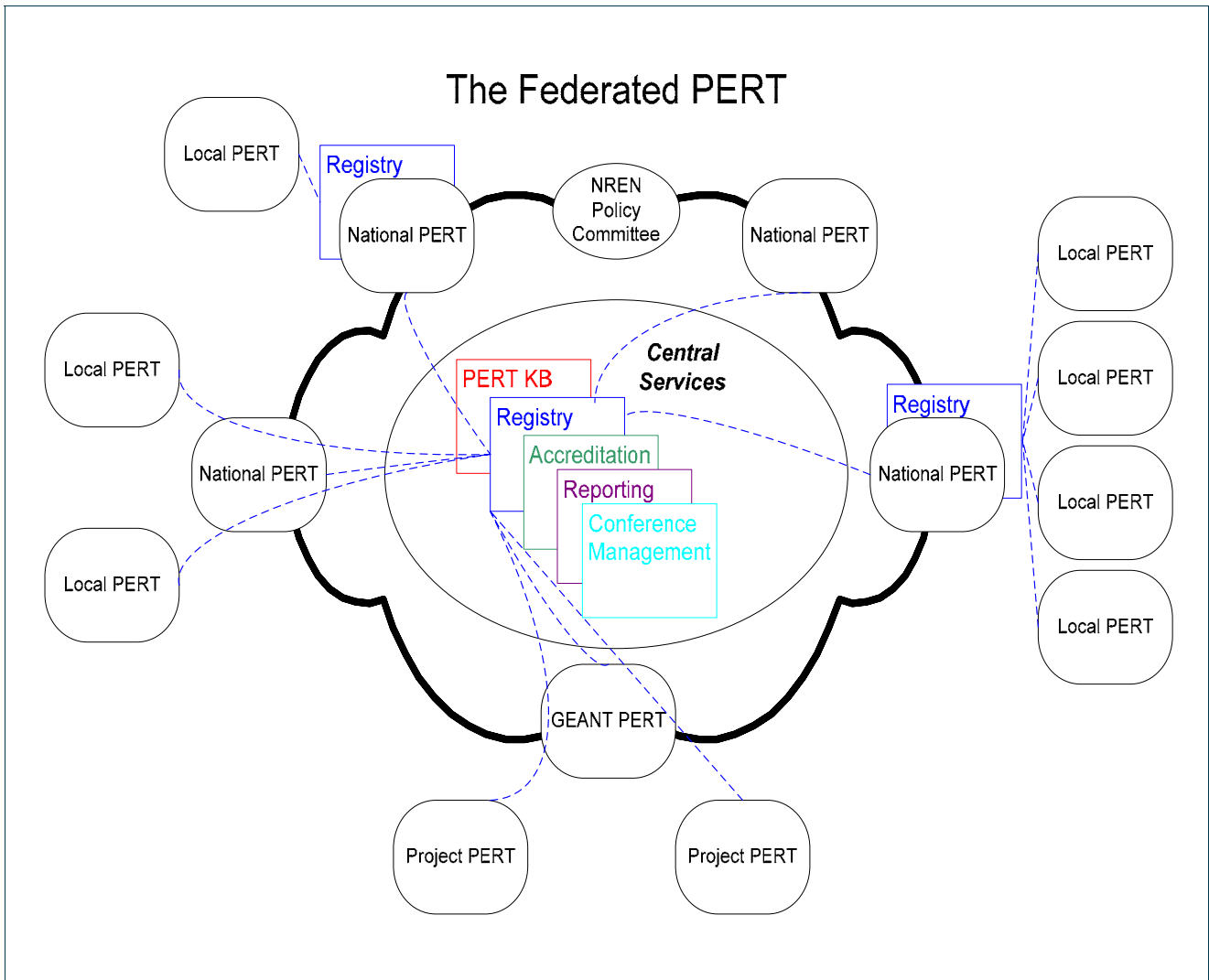


Figure 2.1: The Structure of the Federated PERT

## 2.5 Accreditation

The accreditation service provides application forms for PERTs that wish to apply to become accredited<sup>1</sup>, and assesses the completed applications. The accreditation service is also responsible for checking the responsiveness of accredited PERTs by randomly contacting the PERTs using the details supplied; this is colloquially known as “pinging” and should not be confused with use of the PING command.

<sup>1</sup> Local PERTs seeking accreditation should first notify their intention to their national PERT.

## 2.6 Workshop Management

There are expected to be one or more annual workshops of the Federated PERT, which may be held independently or as an adjunct to an existing meeting such as a Technical Workshop. The workshops will be open to all current and potential members of the federation and their purpose initially will be twofold: firstly, to promote the work of the PERT and encourage new members to register and existing members to seek accreditation; secondly, to spread knowledge about network performance issues through presentations on new topics and reviews of PERT cases investigated.

## 2.7 PERT Knowledge Base

As part of the GN2 project a PERT Knowledge Base was established and made publicly available over the Internet. The PERT Knowledge Base was implemented as a wiki and anyone who self-registered was able to contribute. It has proved to be one of the biggest successes of GN2's new services, with several thousand hits each month. To date SWITCH has been responsible for running and maintaining the PERT Knowledge Base and they have informally offered to continue the service into GÉANT3 (GN3). The regular review and updating of entries in the Knowledge Base – whilst it can and will be done by all PERTs – will be a specific responsibility of the GÉANT PERT once it is properly resourced.

## 2.8 Reporting

To determine what benefits the federated PERT delivers it is important to collect and publish regular reports. All PERTs will be encouraged to submit, on a monthly basis, statistics on the type and number of cases handled, but only accredited PERTs will be required to do so.(see Appendix A for an example of a monthly report). There will also be reports on the amount of PERT Knowledge Base usage.

## 2.9 PERT Ticket System

To record and track PERT cases, the GN2 PERT uses a bespoke trouble ticket system, the PERT Ticket System (PTS), which was developed by PSNC. This system is hosted on a server in the GN2 Point of Presence (PoP) in Poznan and is administered and maintained by the PSNC development team. Some NRENS have expressed an interest in continuing to use the PTS as their national PERT trouble ticket system. Whether this is possible will depend largely on PSNC's willingness to continue supporting the PTS. If, as seems likely, PSNC are prepared to carry on with PTS, then there are two basic options for the central ticket system – either each customer PERT has its own instance of PTS, or PTS is re-developed so that there is only one centralized instance running, but different PERTs' tickets are segregated by default. If PSNC are not prepared to carry on with PTS, and no other NREN is interested in providing a ticket service, then the offered service will be removed.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## 3 Membership Requirements

### 3.1 Types of Membership

There are two grades of membership in the Federated PERT. The entry-level membership is registered membership. Once a PERT is a registered member, it can apply for accreditation.

### 3.2 Registered Membership

#### 3.2.1 Requirements for Registration

To become a registered member of the Federated PERT, an organization must provide the following information by email:

- The organization's full, official name.
- A brief description of the organization's purpose, preferably including the URL of the organization's public website.
- The proposed PERT name; for example "X University PERT".
- Name and contact details of the PERT manager (an email address and a telephone number).
- Private contact details for the PERT (at least an email address and telephone number). These details will **not** be made publicly available.
- Public contact details for the PERT (at least one of an email address, a website or a telephone number). These details will be made publicly available.
- The Primary language of the PERT, and any other languages spoken.

This information should be sent to the GN2 PERT (if the PERT being registered is a national or project PERT) or to the national PERT (if the PERT is a local PERT). If an institute wishes to establish a local PERT and its NREN does not yet have its own registered PERT, then it should send the above information to its normal point of contact at its NREN, with a request that the NREN approves the application and forwards it to the GN2 PERT ([pert-registration@geant2.net](mailto:pert-registration@geant2.net)).

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

Registered PERTs must re-register annually, or whenever any of their basic details change. To do this, they must re-submit (by email) all their basic details as specified above.

### 3.2.2 Benefits of Registration

Registered PERTs have access to the private contact details of all other registered and accredited PERTs, which means they can quickly and easily contact those engineers best placed to help them investigate a network performance issue. Registration is also a prerequisite for applying for accreditation.

## 3.3 Accredited Membership

### 3.3.1 Requirements for Accreditation

If a registered PERT wishes to become accredited it must provide more extensive information than is required for registration and, more importantly, must commit to providing a certain level of service. The accreditation process is interactive, and may involve one or more visits by the Accreditation Service team and/or a Training team. Such visits could be at the request of either the accreditation team (as part of an assessment) or the PERT seeking accreditation (who might wish to take advantage of bespoke training). PERTs seeking accreditation should complete and submit the Application form (see Appendix A) which also specifies what services an accredited PERT is required to provide. The accreditation team is available to offer advice and help with the process, and can be contacted at [pert-accreditation@geant2.net](mailto:pert-accreditation@geant2.net).

### 3.3.2 Benefits of Accreditation

Accredited PERTs have the right to request specific technical information from other accredited PERTs (see Appendix A). They will also have (when implemented) greater privileges when running multi-domain network performance tests.

### 3.3.3 Revocation of Accreditation

If, through its actions or inactions, an accredited PERT fails to meet the standards it has committed to then the Accreditation team will contact the PERT manager to determine the cause of the problem and, where appropriate, will help rectify it. Any further lapse on the part of the PERT may result in it being placed on probation for three months. If during the probationary period the PERT again fails to honour its commitments then its accreditation may be revoked.

## 4 Recommended Practices

### 4.1 Working Practices

Registered PERTs are encouraged to adopt as many of the accredited PERTs' working practices as possible, particularly with regard to stating working hours and response times (though for registered PERTs the target response time is a guide or aspiration rather than a commitment).

### 4.2 Knowledge Levels

Experienced and/or qualified network engineers should be part of the PERT and should have knowledge of/access to the following:

- TCP/IP protocols.
- Network topology, including the makes, models and locations of all network elements, particularly including any "middle boxes" such as firewalls and load balancers, and any other equipment which is transparent to traceroutes, such as LANs and Synchronous Digital Hierarchy (SDH) switches.
- Network status and history, especially any network outages and the use of network paths.
- All adjacent networks (peers and customers), including contact details. If the number of attached networks is large, it is sufficient that they know how to find the information and make contact.
- Read access to all network elements, and the ability to run traceroutes either from the network elements (NEs) or co-located servers.

### 4.3 Case Management and Ownership

Normally the PERT which is first approached for assistance by an end user retains ownership of the case, and is responsible for managing the investigation with or without the assistance of other PERTs and NOCs. However, if the PERT in question believes that, for whatever reason, it is not well placed to manage the investigation, it can agree with another better placed PERT to hand the ownership of the problem over to them (see Figure 4.1).

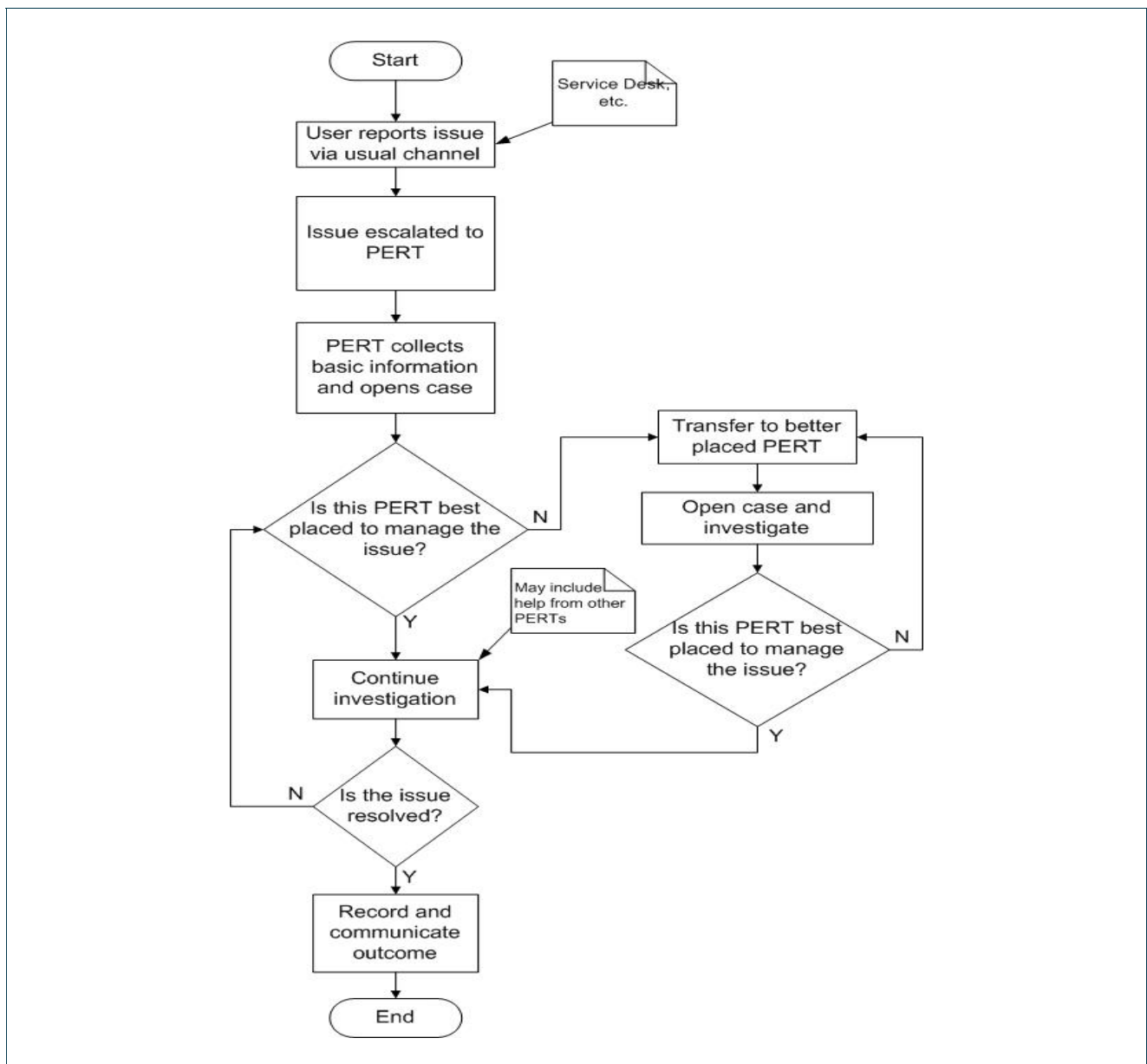


Figure 4.1: PERT troubleshooting process

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## 4.4 Case Histories

After an issue is raised with a PERT, the source PERT should update the central site<sup>2</sup> with a summary/case history of what the problem was, what the symptoms were, and what was required to resolve the problem. Ideally this summary should be added to the central site as soon as a case is opened and then kept up-to-date as the case progresses. However, as this would be a potentially time-consuming task, a more realistic expectation is that the case summary will be added once the problem has been solved and the whole history is known. It is in the interests of all PERTs that they record all case study information for public consumption, leaving out any private information, but ensuring that the history contains enough detail to be useful to anyone encountering a similar problem in future. The case history should state who has provided the summary so that more information can be sought if necessary.

## 4.5 Publicising the PERT

Once a PERT is established, it should be promoted at user group meetings and similar and the appropriate contact details should be made public. It is suggested that the existence of the PERT is emphasised to campus service desks to ensure that they know what it has to offer. In particular Service Desks should be aware that their local PERTs might know of, or be able to quickly find out about, network issues outside the local domain which could nevertheless impact local users.

## 4.6 Escalation

If an accredited PERT does not meet its commitments then action is taken (see Section 3.3.3). Because registered PERTs do not make any commitments with regards to response times and so forth it is unlikely that they would ever be the subject of a complaint. However, if a registered PERT is thought to be acting inappropriately, if the matter cannot be solved by the parties involved, it may be referred to the Registration team who can if necessary remove the PERT from the register.

---

<sup>2</sup> The central site for holding case histories has not yet been selected but will probably be part of the PERT Knowledge Base.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## 5 Conclusions and Future Work

In planning the organization and set up of the Federated PERT three founding principles were observed.

The first founding principle was that every effort was made to make it as easy as possible for NRENs and others to take part in the PERT, whilst ensuring that the resulting service was something more substantial than just a mail-list. An important element of this is the creation of levels of membership, with registered PERTs providing and therefore receiving only basic information, and accredited PERTs providing and having access to much more comprehensive and detailed information. Other than this, the most significant and important difference between registered and accredited PERTs is that an accredited PERT must guarantee a response time which it sets itself, whilst registered PERTs do not have to make any such commitment, and any time they may choose to specify is only a target, not a guarantee.

The second founding principle was the separation of the GN2 PERT from the central services in order to avoid any suggestion that the GN2 PERT has greater responsibility for end-user issues. Whilst it is expected that the GN2 PERT will play an important role in several of the teams that provide the central services, this is primarily because it is well resourced (1+ FTE), not because it has any special status. It is expected that those NRENs who help provide the central services will be eligible for project funding (GN2 or GN3).

The third founding principle was to keep the whole structure as simple and as unconstrained as possible. As such, there are no proscriptions on how a member PERT must interact with its users, or what tools and procedures it must use. Whilst such an approach is entirely appropriate at the start of the service, it has some disadvantages. For example, there are no procedures or methods to prevent a given incident being reported as more than one PERT case in the monthly reports. This is unlikely to be a problem in the early stages of the Federated PERT when the number of cases is low and can easily be checked by the Reporting team but it may become an issue in the future. If this happens, it might be deemed necessary to institute additional requirements and procedures. For example, accredited PERTs (and others wishing to submit monthly statistics) may be required to observe some formal procedures when opening new cases, and transferring ownership of existing cases. One way to do this might be to use a common trouble ticket protocol, similar to the GGUS ticket system used by EGEE for example. GGUS can synchronize its own records with the trouble tickets kept in completely independent legacy systems. In the future the Federated PERT might adopt common procedures for synchronizing tickets between different systems, or there might be a centrally run system which receives copies of all tickets and keeps track of which are related to the same problem.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

Notwithstanding the above example of trouble ticket accounting, in general the Federated PERT is expected to remain relatively simple with minimal additional overhead for those who do not wish to get involved in providing the central services.

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## 6 Acronyms

<b>BDP</b>	Bandwidth-Delay Product
<b>CM</b>	Case Manager
<b>E2E</b>	End-to-End
<b>FTE</b>	Full Time Equivalent
<b>Gbps</b>	Gigabits per second
<b>IP</b>	Internet Protocol
<b>IT</b>	Information Technology
<b>kbps</b>	Kilobits per second
<b>LAN</b>	Local Area Network
<b>Mbps</b>	Megabits per second
<b>MP</b>	Measurement Point
<b>NE</b>	Network Element
<b>NOC</b>	Network Operations Centre
<b>NREN</b>	National Research and Educational Network
<b>OS</b>	Operating System
<b>PERT</b>	Performance Enhancement Response Team
<b>POC</b>	Point of Contact
<b>PoP</b>	Point of Presence
<b>PTS</b>	PERT Ticket System
<b>QoS</b>	Quality of Service
<b>SCM</b>	Special Case Manager
<b>SDH</b>	Synchronous Digital Hierarchy
<b>TCP</b>	Transmission Control Protocol
<b>WAN</b>	Wide Area Network
<b>MSR</b>	Monthly Service Report

## Appendix A Application for Accreditation

PERTs seeking accreditation should complete this form and submit it via mail, fax or email (as a scanned attachment). Please complete all fields – use “NA” for fields which are not applicable. The form is split into several sections, and each section has an introduction to explain its general purpose. Each table has three columns. The left hand column states the information sought. The middle column is where your information should be entered – there may be explanatory notes in angled brackets (<>), which should be deleted. The right hand column is the access level and indicates whether the given information should be publicly accessible (P), restricted to registered PERTs (R), or only available to accredited PERTs (A). Section 1 has the access levels pre-filled in but in all other sections you must specify the access levels yourself (except where “NA” is shown, indicating that access level is not applicable for that line).

### Section 1: Basic Information

This section checks the accuracy of any information already held.

PERT Name		P
Month and year of registration		NA
PERT Manager	Name: Address:  Email: Telephone 1: Telephone 2: Fax:	R
PERT public contact details	Email: Telephone: Website:	P
PERT private contact details	Email: Telephone: Website:	R
Languages spoken	Primary: Other(s):	P

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## Section 2: PERT Working Practices

The information you provide below will let other PERTs know how quickly they can expect a response to a request for help or information. For “PERT Availability” you should specify what time zone applies. The “Response Time” (which you set yourself) is measured in working hours, so for example if your declared response time is 4 working hours, and your hours of work are 0900-1800 Monday-Friday, then a request submitted at 1700 on Friday must be replied to by 1200 the following Monday. You can declare any response time you wish but typical values are 2 hours, 4 hours, 1 day, and 2 days. If you wish to declare a response time of longer than 2 working days then you should contact the Accreditation team, because such a slow response time would not normally be appropriate for an accredited PERT.

PERT availability	Normal working hours: Weekend hours: Non-working days (including national holidays):	
Response Time	<In working hours or days.>	

## Section 3: Detailed Network Information

The information below will help other PERTs to determine when your domain is on the path of a problematic traffic flow, and if there are any services or devices in use which may affect the normal behaviour of transiting traffic. Ideally you should also provide a network topology diagram.

Network AS number(s)		
Network Prefixes	IPv4 range(s): IPv6 range(s):	
Diagram sent to Accreditation team?	<Yes/No/Not yet.>	
Quality of Service	<Do you use any QoS? If so, what type (DSCP, 802.1p, and so forth) is it? What is it used for (for example, for providing a Premium IP service)?>	
Middle-boxes in use	<A middle-box is any specialist device through which production traffic flows and whose purpose is not the switching or routing of traffic. They include (but are not limited to) firewalls, network address translators, traffic shapers and load balancers. It is sufficient to list the types of device in use, though it is preferable to also list their make/model. It is also helpful but not necessary to specify where they are deployed.>	

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## Section 4: Network Performance data, monitoring tools and services

The information provided in this section will tell others what network monitoring data you collect, and how they can make use of it (which might be directly through a public website, or indirectly by making requests to the PERT).

Network performance data collected	<List of metrics recorded, for example, byte counters for all interfaces collected every 10 minutes.>	
Publicly-accessible information	<The URL of any publicly accessible site with performance related information, and a brief description of what the site offers – for example weather map. If there is no such public information state “NA”.>	P
PERT-accessible information	<The URL of any PERT-only site, and a brief description of what the site offers, for example “links utilization”.>  Method of access: <Ideally in future all restricted sites will be accessible via eduGAIN, but either way the method of accessing each of the above resources should be stated here.>	
PERT-accessible tools	<Details of any other tools that other PERTs can access, for example iperf/BWCTL servers.>	
Offered services	<Any special services you offer to users and/or PERTs, for example trace file analysis.>	

## Section 5: PERT Staff

It is recognised that not all engineers in the PERT will have the same level of knowledge and experience, or areas of expertise.

Access Level	<Specify “P”, “R” or “A” for the information in the table below. Public access is not recommended.>
--------------	---

Name	Role	Contact details	Experience	Areas of expertise and interest
	<One or more of engineer, manager, or deputy-manager>	Email:  Telephone:	NREN: <year joined NREN.>  Networks: <year became a network engineer.>	

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## Appendix B Monthly Service Report Format

### B.1 Section 1: PERT Reporting

Accredited PERTs are required to submit Monthly Service Reports (MSRs) about their activity to the Reporting Service. Registered PERTs are not required to submit reports, but are strongly encouraged to do so, especially if they are seeking accreditation.

#### B.1.1 Case Statistics

Status	Type	Low throughput	Slow Response	Degradation	Advice	Other
New						
Open						
Closed						
Total						
Assisted (PERT)						
Assisted (Other)						

#### B.1.2 Notable Case Summaries

Case Number	Summary

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

### B.1.3 Explanatory Notes:

- **New:** All new cases reported by users, or transferred over from another PERT.
- **Open:** All cases still open at the end of the month, new or otherwise.
- **Closed:** All cases closed during the month, new or otherwise.
- **Total:** The total number of PERT cases managed this month, that is to say the sum of Open and Closed cases.
- **Assisted (PERT):** The total number of cases which the PERT assisted with, but which were actually owned by another PERT.
- **Assisted (Other):** The total number of cases which the PERT assisted with, but which were actually owned by some other non-PERT organization.
- **Case types:** Based on the users' experiences and perceptions (select the option that is closest to the probable cause). PERT cases can be divided into the following broad categories.
  - **Low throughput:** The user's traffic systems are not transferring data at the expected rate.
  - **Slow response:** The user is experiencing unexpected delays with interactive applications (webpages slow to load, remote terminal sessions slow to echo typed characters, delays in conversation).
  - **Degradation:** Especially in relation to voice and video, but not solely, and covers noise and dropout.
  - **Advice:** Those occasions when advice was given that did not particularly relate to a given issue (for example, responses to users requesting advice on end-system TCP configurations or LAN switches).
  - **Other:** A catch-all for all other unforeseen types of performance problems.

PERTs are requested to complete the Summary Table for all notable cases they have managed (or are managing). At the very least this should include a brief description of any 'Other' cases, but other than this the decision as to what counts as notable is entirely at the discretion of the PERT itself. In making that decision, the PERT should note the fact that the primary audience for the MSR consists of the senior and operational managers of the NRENs (plus the European Commission) so it is beneficial to report any case which has a bearing on future decisions (for example, where a user has directly suffered as a result of network congestion, which might be alleviated by an upgrade of that circuit). This is not to say the MSR is the only – or indeed primary – vehicle for highlighting such a problem, but it will reinforce the point).

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## B.2 Section 2: Federated PERT Monthly Report

The reports submitted by individual PERTs will be included verbatim in the MSR, and also used to compile a summary, formatted as follows:

- PERT Reports.
- Federation Overview.
- Accredited PERTs: <list of accredited PERTs>.
- Candidate PERTs: <list of PERTs applying for accreditation>.
- Registered PERTs: <list of registered PERTs, by country>.
- Contributing PERTs: <list of PERTs who submitted reports for the month>.
- Missing reports: <list of accredited PERTs who did not submit a report>.

### B.2.1 Summary Statistics

Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Apr
<b>Status</b>												
New												
Open												
Closed												
<b>Total</b>												

### B.2.2 <Month> PERT Case Analysis

Type	Low throughput	Slow Response	Degradation	Advice	Other
<b>Status</b>					
New					
Open					
Closed					
<b>Total</b>					
Assisted (PERT)					
Assisted (Other)					

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

## Appendix C Suggested Case Management Procedure

When a user, directly or indirectly, requests the assistance of a PERT the following process is recommended:

- Check the eligibility of the person making the request. A user qualifies for PERT assistance if they use a network operated by a GN2 participant and their requests take priority over ineligible users, who may be given assistance if time and resources permit.
- Only open a PERT case if a networked system is not performing as expected, the problem appears to be caused directly or indirectly by the network and is not obviously the result of specific hardware failure.
- Gather the following information:

Information	Description	Importance
Problem description	Description of the current system behaviour.	Must have
User's expectations	The user's expectations as to how the system should behave.	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	The requestor's email 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
Traffic type	Internet Protocol, source port, destination port.	Must have
A-end user details	Details of the A-end technical Point of Contact (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 traceroutes are 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, Operating System (OS), application.	Should have
B-end host details	Hardware, OS, application.	Ideally have
Must have = information the user must provide before the investigation begins.		

Project:	GN2
Deliverable Number:	DS3.12.4
Date of Issue:	10/06/08
EC Contract No.:	511082
Document Code:	GN2-08-101

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.

**Table 6.1:** Information gathering

- Gather additional information where possible/necessary.
- Draw the path:
- Run the available tests and check any available statistics.
- Search the PERT Knowledge Base against the category of problem or the particular network element that is the suspected bottleneck.
- If necessary, request the assistance of an appropriate subject matter expert.
- Propose and test a resolution.
- After the issue is resolved and/or the reason for the problem is understood contact the end-user and pass on any findings, and create a resolution description.
- Create a Knowledge Base article for the issue or update an existing article.
- Cross-reference the ticket.
- Detail any tools used and how successful/useful these tools were.
- Once the end-user is satisfied with the case result and the Knowledge Base article has been written, change the ticket status to “closed”.