Tele-Help and Remote Service Provision Using RESORT Prototype System

Paul Panek[1], Christian Beck[1], Andreas Hochgatterer[2], Stefan Mina[3], Barbara Prazak[2], Gottfried Seisenbacher[1], Mathijs Soede[4] and Wolfgang L. Zagler[1]

[1] fortec - Research Group on Rehabilitation Technology,
Favoritenstrasse 11/366-1B, A-1040 Vienna, Austria
`{panek, chb, gs, zw}@fortec.tuwien.ac.at`
`http://www.fortec.tuwien.ac.at/resort`

[2] Integr@Point, Lebenshilfe NÖ / ARC Seibersdorf research GmbH,
Viktor-Kaplan-Strasse 2, A-2700 Wiener Neustadt, Austria
`{andreas.hochgatterer, barbara.prazak}@integranet.at`

[3] Förderzentrum Elisabethinum Axams, Mailsweg 2, A-6094 Axams, Austria
`s.mina@elisabethinum.at`

[4] iRv - Institute for Rehabilitation Research, Zandbergsweg 111,
NL-6432 CC Hoensbroek, The Netherlands
`msoede@irv.nl`

Abstract. The DE-4208 RESORT tele help prototype provides remote support for disabled users of PC based Rehabilitation Technology (RT) and their care persons in order to reduce existing barriers in daily usage and service of RT. The current RESORT prototype and its interface specification support also synchronisation of single switch users over narrow bandwidth network channels. The IP based RESORT system with its scaleable user interface is described explaining also the remote service API which allows to make already available RT software products ready to benefit from RESORT's tele help functionality. Experiences from real life tests and an outlook to current and future activities are given.

1 Introduction, State-of-the-Art and Aim

An increasing number of disabled people is using Rehabilitation Technology (RT) systems which help them to live more independent and self-determined lives. Analysis of the provision process shows that buying and installing an up-to-date RT system is definitely not the end, but much more the starting point of a process of continuously tailoring the system to the ever changing needs of the individual user.

In many cases the carers (teachers, therapists, family members) are the key agents in this process. Often a lack of experience in using and configuring RT systems causes a resulting lack of adaptation and frequently the total abandonment of Rehabilitation Technology. Generally spoken, it is anticipated that the actual use of RT systems is much lower than the real need. Currently, support is a complicated and expensive procedure due to high travel efforts and to frequent hands-on involvement of profes-

sional support personnel. The RESORT system was especially designed in order to overcome this situation by providing means for tele help and remote service functionality dedicated to disabled persons and their carers [14], [32], [34].

2 Methods

The RESORT prototype system developed by the EU's DE-4208 RESORT consortium 1998-2001 provides the following functionality: (a) RCI (Remote Control Interface) for "real time synchronisation" of two RT systems, one with the disabled user and one at the location of the service provider, (b) easy-to-use scaleable User Interface, (c) real time communication and interaction: audio, video and text, (d) database access, (e) file transfer, (f) synchronisation of local and remote file systems, (g) platform in-dependency and (h) security. It offers three different modes of operation: (1) hands-free audio communication between user and service provider with optional video link, (2) student-teacher mode for real time synchronisation of RT systems which is important for single switch users over links with narrow bandwidth and (3) tele-service-mode for technical maintenance.
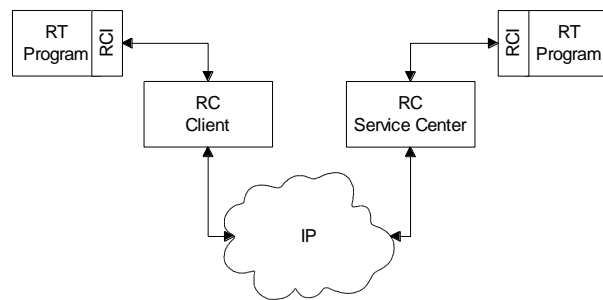
Fig. 1. Remote Control Interface (RCI) between RT software application and RESORT Controller (RC) software running on client side and on Service Centre side. The specification of remote service API [32] allows to integrate an RCI into already existing RT software products

The RESORT system exploits existing technologies for tasks like video / audio transmission according to H.323 specification and desktop/application sharing according to T.120. The user interface of the RESORT controller can be tailored according to the needs of the users. Although the full functionality is always available, the degree of complexity of functions and interactions can be varied within a wide range.

The RCI (Remote Control Interface) and the RESORT protocol allow synchronisation in real time. This is possible as only small data messages are transferred instead of changed screen contents. This method dramatically reduces the required bandwidth [4] and enables the RESORT system to provide real time monitoring of single switch users. The RESORT controller module (RC) is linked to (a) communication modules for video, audio and text-chat, (b) to the database, (c) to the RT system and (d) via

network interface to the remote RC. IP serves as network protocol. The RESORT system is a highly modular system which allows to exchange specific parts without the need of adapting other parts. This increases the independence from 3rd party products for audio, video, application sharing, etc. More details can be found in [14], [32].

Fig. 2. Screen Shot from a RESORT Client during a Tele-Service session in Vienna. A non-speaking head stick using person runs an environmental control and communication system called AUTONOMY [31], [35] which is equipped with a RESORT Interface. The service centre can be called from inside the AUTONOMY system

Two different but compatible RESORT prototypes were implemented. The first one was written in Sun Java 1.3 and was released in 2000. In 2001 a second prototype was written in Delphi and now is downloadable as evaluation kit [14]. In order to test and demonstrate the benefits two already existing RT systems [25], [35] have been equipped with RESORT interfaces. The prototype system was demonstrated in several workshops, additionally real life tests have been carried out [34].

3   Results

The results from the real life tests have shown that the system was usable by disabled people and their primary carers. Furthermore, both primary and secondary carers consider the system a viable tool for the delivery of support for users of RT systems. In general, the results of the demonstrations and trials endorsed the need for the RESORT type architecture, but recognised that it would cause operational changes in the care services. When demonstrated to care service providers, they were particularly

interested in the potential for rapid access to engineering and technical support. They also saw great potential for on-line conferences involving a group of different care providers involved with an individual client.
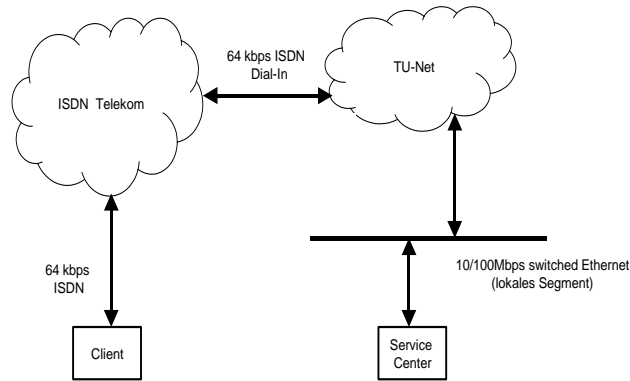

Fig. 3. Screen Shots from RESORT Service Centre during a Tele-Service Session. Left picture shows controls for video and text communication, right picture contains controls for remotely starting and terminating RT applications at the client side

During trials with the RESORT system features like the live video and the audio link gave most of the potential users a feeling of security. Getting a picture from the person who is actually helping me to fix my problem is a very important point for the client but also vice versa it can be helpful for the operator at the RESORT service centre to see the client. It can be recognized if the user is perhaps confused or makes an impression of being stressed by the current situation. Certainly the user has to be able to decide himself or herself if the video is transmitted to the service centre. The default mode is that the video from the service centre is enabled and the video to the service centre is disabled.

Especially for novice or less experienced computer users application sharing is very helpful but it is certainly one of the most risky features of the system. Abuse could cause serious damage to a clients system or private information could get to not authorised persons. Thus, specific security issues had to be considered [32]. At the other hand a problem on the computer may be solved in a few minutes what usually would take a technician some hours to travel to the customer (certainly charging for travel costs). Additionally it turned out during real life tests and demonstrations that there is a very good learning effect for the client user when the client can watch what the operator from the service centre is modifying remotely.

The tele-help and remote service systems will get more and more important (especially through the new high speed network systems) and bring several advantages for the users. The feedback from the RESORT users also shows that such systems are really requested by them.

64 kbps ISDN
Dial-In

ISDN Telekom

TU-Net

64 kbps
ISDN

10/100Mbps switched Ethernet
(lokales Segment)

Client

Service
Center

Fig. 4. Network structure using 64 kbps Uplink from Client to University Network during real life test of RESORT system with head stick using person (see Fig. 2) in Vienna. This real life test started end of year 2000 and is still on-going using the latest RESORT software version which can be downloaded from [14]

4 Discussion

The RESORT prototype system demonstrated a multitude of benefits which will help to overcome existing barriers in the field of RT service provision. One important aspect is security and data protection. It is absolutely necessary for the user to have the possibility to decide what he/she allows or not and that the tele-help session could be terminated immediately if there is the impression that something is going wrong. Another point is the education of the service centre operators and maybe the usage of network encryption technology to ban attacks by third parties.

In parallel to the RESORT prototype software the RESORT protocol has been developed and documented. A remote service API allows other manufacturers to adopt the RESORT protocol for their products in order to benefit from tele-support functionality [32]. An evaluation version of the RESORT software package is available [14]. Ongoing research and development is done under the umbrella of the RESORT Interest Group (RIG). The RIG provides a framework for disabled users, care persons, manufacturers, service providers, and researchers to continue the engagement in the area of remote service provision. Interested parties are invited to visit the RESORT and RIG home page [14].

One of the two RESORTed RT prime examples - Mr.Step [25] - heavily stresses the features provided by a telematic link between professionals and clients. The version just marketed (Mr.Step 1.1 Viewer) is a client version which allows to import modules provided by (exported from) the forthcoming Professional version. A typical scenario is that a therapist configures and creates new modules which might then be delivered over a RESORT link to the client's home PC (RESORT interfaces are already implemented and a RESORT compliant version of Mr.Step is planned to be released). Furthermore the professionals can then guide and monitor the training proc-

ess in real time (tele-training supporting single-switch users of Mr.Step as well). This enhances the process of interaction in teaching and training.

The Information Centre Integr@Point in Lower Austria, which provides RT specific consulting and is prepared to be a further part time RESORT service centre, supports clients in the surrounding of about 150 km around their premises in Wr. Neustadt. One recent example shows that only the travel costs to visit a severe motor and vision impaired client, who is currently evaluating a communication software tool with single switch input and auditory scanning features, are approximately EUR 220,-. Problem solving via telephone often was not successful and minor problems had to be solved through visits. Now a second level support became necessary because a small adaptation of the software has to be built in by the programmer (located in Germany). This example illustrates which enormous benefits the RESORT system might introduce if used in such a setting.

In mid of year 2001 first part time service centres have been set up at TU Wien and at an Austrian SME. RESORT not only aims at technical service delivery but also at pedagogic and therapeutic support via the telematic channel. Tele-Support and Remote Service Provision is an encouraging area in the field of RT which will improve significantly the quality of life of disabled persons.

Acknowledgement

References

1. Criswell, A., Backer-Thompson, R.: Missouri's Telecommunications Access Program for Internet – A Statewide Delivery Model for Assessment and Training, Proceedings of CSUN 2002 Conference, http://www.csun.edu/cod/
2. Davalli, A., Sacchetti, R., Bonivento, C., Ugolini, M.: Tele-assistance for upper-limb myoelectric prostheses, Proc. XV World Computer Congress, Vienna, 31 Aug.- 4 Sept. 1998
3. Lin, A., Fleming, B.T., Doyle, M.: Use of Video Teleconferencing Technology for Off-Site Assistive Technology Services, Proceedings of CSUN 2002, http://www.csun.edu/cod/
4. Lysley, A., Colven, D.: CATCHNET - Remote Support for Switch Users, Proceedings of the International Society for Augmentative and Alternative Communication, Dublin, August 1998, 306-307

5. Tran, B.Q., Krainak, D.M., Winters, J.M.: Performance Evaluation of Commercial POTs-Based Videoconferencing Systems, Technical Report HCTR-11-v1.0, Sept. 1999
6. Burns, R., Hauber, R. and Vesmarovich, S.: Telerehabilitation: Continuing Cases and New Applications, Proc. of the RESNA International 2000 Conference, Orlando, 2000, 258-260
7. Lathan, C. E., Malley, S.M.: Telerehabilitation and Robotics: Integrated Systems for Children with Disabilities, Proceedings of CSUN 2002 Conference, http://www.csun.edu/cod/
8. Gray, C., Lysley, A., Donegan, M.: TELENET – The use of telecommunications to provide remote assessment, support and training to children and young people with severe physical and communication difficulties and to those supporting them, Health & Social Research Application, ACE Centre, Oxford, UK, 1999
9. Trepagnier, C., Noiseux, J., Greene, E.: Incorporating Videotelephone Contact into Provision of Supported Employment, Proceedings of CSUN 2001 Conference, http://www.csun.edu/cod/
10. Truche, C., Mokhtari, M., Vallet, C.: Telediagnosis and remote maintenance system through the Internet for the Manus robot, Assistive Technology on the Threshold of the New Millennium, Bühler, C. and Knops, H. (eds.), IOS Press, 1999, 302 - 307
11. Cole, E., Ziegmann, M., Wu, Y., Yonker, V., Gustafson, C. and Cirwithen, S.: Use of "Therapist-Friendly" Tools in Cognitive Assistive Technology and Telerehabilitation, Proceedings of the RESNA International 2000 Conference, Orlando, Florida, USA, 28th June - 2nd July 2000, 31-33
12. Allen, D., Serre, M., Beynon, M.: Internet and Videoconferencing Technologies – Advantages for the Deaf, Deafened and Hard of Hearing, Proceedings of CSUN 2002 Conference, http://www.csun.edu/cod/
13. Lauderdale, D., Winters, J.M.: Evaluation of Nine IP Teleconferencing Products, Technical Report HCTR-12-v1.0, Sept. 1999
14. DE-4208 RESORT and RESORT Interest Group (RIG). Retrieved April 22th, 2002 from fortec site on the World Wide Web: http://www.fortec.tuwien.ac.at/resort
15. Irwin, E.R.: Improving Communication and Coordination of Assistive Technology Services, Proceedings of CSUN 2002 Conference, http://www.csun.edu/cod/
16. European Commission: Design for All and ICT business practice: Addressing the barriers - Examples of Best Practice, Telematics Applications Programme, Disabled and Elderly sector, Seminar on "Design-for-All" for an Inclusive Information Society, Bruessels, 1998
17. European Commission: Study on Technology Trends and Future Perspectives within Assistive Technologies, IST, October 2000
18. Burdea, G., Popescu, V., Hentz, V., Colbert, K.: Virtual Reality-Based Orthopedic Telerehabilitation, IEEE Transactions on Rehabilitation Engineering, vol. 8, no. 3, September 2000, 430-432
19. Hazell, G., Colven, D.: ACE Centre Telesupport for Loan Equipment – Service Delivery Models: Training and Support, Report to the Department of Health, ACE Centre Advisory Trust, Oxford, 2001
20. Verburg, G., Borthwick, B., Rumney, P., Speed, P., Hymus, G.: "Digitizing Glenda": Electronic Outreach and Remote Rehabilitation Projects, Proceedings of the AAATE Conference '99, Düsseldorf, 1999, in: Bühler, C., Knops, H. (eds.): Assistive Technology on the Threshold of the New Millennium, Assistive Technology Research Series, vol. 6, IOS Press, Amsterdam, 1999, 679-683
21. Vanderheiden, G.: Telecommunications – Accessibility and Future Directions, Proceedings of CSUN 2001 Conference, http://www.csun.edu/cod/
22. Williams, G., Doughty, K., Bradley, David A.: A Systems Approach to Achieving CarerNet – An Integrated and Intelligent Telecare System, IEEE Transactions on Information Technology In Biomedicine, Vol.2, No. 1, March, 1998, 1-9

23. Hine, N.A., Gordon, I.A.S., Beattie, W., Arnott, J.L., McKinlay, A., Kravcik, M., Bebjak, A., Moravcikova, L, Arato, A., Tolgyesi, J., Giese, P., Blasovszky, B. and Seiler, F.P. "An interactive distance education service utilising the World Wide Web - a preliminary study", In Proceeding of the 8th Joint European Network and Computers Conference JENC 8, Edinburgh, 11-15th May 1997

24. Henderson, J., Lariviere, J.: "Optimizing Assistive Technology Service Delivery with Video Teleconferencing" Grant Progress Report, Proceedings of CSUN 2002 Conference, http://www.csun.edu/cod/

25. Learning and Training system Mr.Step, http://www.integranet.at

26. Donegan, M.: TeleNet Progress Report, ACE Centre, Oxford, June 2001

27. Jones, M.L.: E-Rehab: Applications of Network Technologies in Medical Rehabilitation, Instructional Course, American Congress of Rehabilitation Medicine, Oct. 25-28, 2001, Tucson, Arizona. Retrieved on April 10th, 2002 from Word Wide Web: http://www.telerehabilitation.org

28. Microsoft NetMeeting 3.0 Resource Kit, 1999, Microsoft Corporation

29. Nelms, G. and Colven, D.: The Efficacy of Telesupport for Loan Equipment, Proceedings of the 9th Biennial Conference of the International Society for Augmentative and Alternative Communication, Washington DC, USA, August 2000, 498-500

30. Lewis, P. , Isaacs, J., Simmons, T.J. , Bauder, D.: Assessing Children's Assistive Technology Needs Through Video Conferencing, Proceedings of CSUN 2002 Conference, http://www.csun.edu/cod/

31. Panek, P., Beck, C., Seisenbacher, G., Zagler, W. L.: Technical Assistance for severely disabled Persons with integrated Tele-Help, Proceedings of the International Federation for Medical & Biological Engineering, in: Magjarević, R., Tonković, S., Bilas, V., Lacković, I. (eds.), MEDICON - IX Mediterranean Conference on Medical and Biological Engineering and Computing, June 12-15, 2001, Pula, Croatia, 700-703

32. Panek, P., Zagler, W. L.: Final Report DE-4208 RESORT - Remote Service of Rehabilitation Technology, Telematics Application Programme (TAP), European Commission, DG XIII/CE, March, 2001. Electronically available on http://www.fortec.tuwien.ac.at/resort

33. Panek, P., Zagler, W.L., Beck, C., Seisenbacher, G.: Smart Home Applications for disabled Persons - Experiences and Perspectives; Munich; 04.10.2001 - 05.10.2001; in: "EIB Event 2001 - Proceedings"; 2001, 71 - 80

34. Panek, P., Zagler, W.L., Beck, C., Hine, N., Seisenbacher, G., Stefanakis, N.: Providing Tele-Support and Tele-Training to severely disabled Persons using IP-based Networks, Proceedings of VIEWDET 2001, Vienna International Workshop on Distance Education and Training, 6.-7.12.2001, 37-51

35. Technical Assistance System AUTONOMY, http://www.fortec.tuwien.ac.at/autonom

36. Zagler, W.L., Panek, P., Flachberger, C.: Technical Assistance for Severely Motor- and Multiple Impaired Children, Proc. of the 10th IEEE CBMS Symposium, Maribor, 1997

37. Zagler, W.L., Panek, P.: Assisting the Facilitators – Interface Design and Telematic Support for IT-Based Assistive Technology, Technology and Disability, no. 10, 129-136, IOS Press, 1999