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FEATURES

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Mobile Radio systems can provide a lifeline in organising relief efforts. Dag Nielsen and Jennifer Hilborn discuss Ericsson's response to the UN's call for action on this subject.

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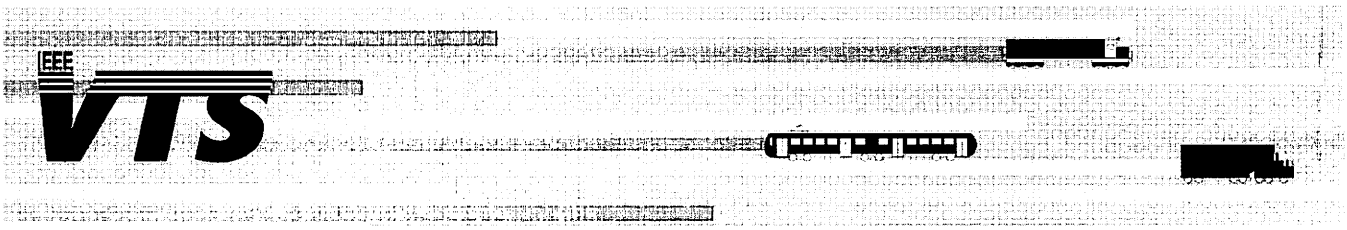

FORWARD

James Irvine, Editor

As a member of the Vehicular Technology Society who works mainly in the mobile radio domain, I am often asked 'what has the VTS to do with wireless?'. I can give no better answer than to direct the enquirer to the VTS web site and Sam McConoughey's excellent piece on the background of wireless in the VTS. However, the same question came up in a different form a few weeks ago – 'what has automotive electronics to do with mobile radio?'

Of course, the question could also be asked of land transportation, or even between land transportation and automotive, since the former includes much on the heavy power side not applicable in the automotive field, and the communication problem is different between, particularly, automotive and railway systems.

One common theme over all three areas is the autonomy of the system. This makes similar technology applicable. For example, fuel cells which have been researched for automotive applications are reducing in size to the point where they offer solutions for powering mobile radios. With much higher power densities than rechargeable batteries, very long service times are possible.

The science of engineering is one of solving problems, and solutions often come applying solutions from one field to a different, although perhaps related field. A perfect example of this was the talk 'Fast Cars, Big Bandwidth, & Java : Is this Geek Heaven?' given by David Douglas, VP of Network Experience at Sun to the VTC2000-Fall conference. One of the speakers in the Discussion Panel of 3G Mobile and Beyond (a full report of the conference will appear in the next issue), Mr Douglas discussed the evolution of the motorcar from a means of transport to a telemetry and entertainment system, and the tension between a business model which desired centralised control (to make money), and innovation, which pulls towards a distributed system. He listed a series of basic requirements : a 'platform' with core functionality, longevity with upgradability, 'hardware' independence, scalability both up and down, an evolving security model, and an environment with tools and the training to use them. With the timing of a magician, having got the audience's agreement of the desirability of these properties in an automotive electronics environment, he then pointed out their applicability to mobile radio. Different problem, similar solutions.

Engineering is increasingly interdisciplinary. The IEEE is recognising this through the creation of Technical Councils involving a number of different societies. ITS is clearly vehicular technology, but it involves a number of different activities as well, which is why it ITS Council involves seventeen societies. The new Sensors Council has twenty six (VTS included).

So, the next time someone asks why the VTS covers such seemingly diverse technologies, point out the advantages that gives us!

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WIRELESS STANDARDS DEVELOPMENT - A NEW PARADIGM

Stephen M. Blust, Chair, ITU Working Party 8F

This paper describes fundamental changes that have taken place in the development of international commercial wireless telecommunications standards and traces the steps in this evolution. The development of the recommendations, technical specifications and standards for the air interfaces for the next generation of commercial wireless systems is used as an illustrative example of these changes. This next generation of wireless which is known as IMT-2000[1] in the International Telecommunications Union (ITU) also referred to as Third Generation (3G) wireless. The process created by the ITU in developing Recommendations for IMT-2000 sets a new framework for international cooperation in telecommunications standards development.

Introduction

The International Telecommunication Union (ITU) has long been a focal point for the development of international telecommunications standardization activities by developing documents known as Recommendations. These Recommendations are developed in each of the two sectors of the ITU – the Radiocommunication Sector (ITU-R) and the Telecommunication Standardization Sector (ITU-T). The efforts of the ITU have been supplemented for many years by a variety of national and regional telecommunications bodies. Within the last decade, however, the number of telecommunications standards development (both accredited and de-facto) and technology proponent organizations has grown significantly. Many of these new organizations (e.g., the ATM Forum, SDR Forum) are international rather than national or regional in scope. Furthermore, many of these organizations were created for standardizing a very specialized technology while others are more broadly based although most are not as broadly based as the ITU.

In this changing environment, a critical need has developed for close coordination between these various standards development organizations and similar entities. This close coordination is needed:

1) to ensure that there is no duplicative effort and that the "wheel is not reinvented", and
2) to ensure that the necessary standards are developed in an efficient manner such that the rapidly changing needs of the marketplace are met, and
3) to address the fact that development of very complex systems with severe time to market challenges can no longer be completed by any single organization, entity or company.

In the commercial wireless area, the focus of recent standardization activity has been on the third generation (3G) systems which are referred to in the ITU as IMT-2000 (see Appendix A for an overview of IMT-2000). Several international organizations were created. in response to marketplace demands for the rapid development of technical specifications for 3G systems. Brief descriptions of these organizations known as Partnership Projects and Technology Proponents are provided in Appendix B. Thus, there are now a number of additional standards/specifications development organizations focussing on commercial wireless that are international in scope rather than specifically national or regional. The International Telecommunication Union has responded positively to these new international wireless specifications development organizations by creating a "win-win" atmosphere in which there is a role for all of the national, regional and international standards bodies.

It is the purpose of this paper to describe this new paradigm of commercial wireless standards development in the international arena and to show how this "new way of doing business" for commercial wireless standards development will continue and can be a role model for other areas of telecommunications standards development.

Timeline of the Changing Wireless Landscape

Commercial wireless systems are generically described by their "generation." Although there is no precise definition of the generations, the following definitions can be loosely applied:

- **1st Generation (1G)** – analog mobile systems including analog cellular and its predecessors, e.g., AMPS, TACS, NMT
- **2nd Generation (2G)** – digital mobile systems including cellular and personal communications systems, e.g., GSM, IS-136 TDMA, IS-95 CDMA, DECT
- **3rd Generation (3G)** – digital mobile systems having greatly enhanced performance and service characteristics including high speed data (up to 2 MB/s), e.g., IMT-2000 technology family

Figure 1 depicts, generically, the evolution from 1G to 3G and beyond on a rough timeline. Also shown on the upper portion of the Figure are high level capabilities associated with each of the generations. The lower portion of the Figure shows, on the same time scale, the level of globalization of standardization activities associated with each generation. The term "level of globalization" relates to whether the

[1]Details on IMT-2000 and its related Recommendations can be found at http://wwww.itu.int/imt

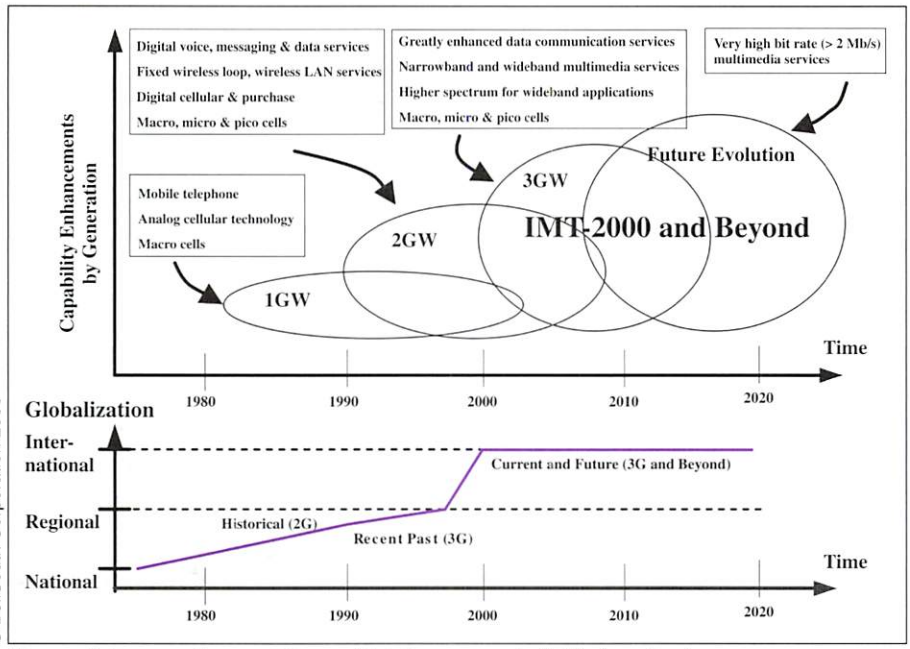


Figure 1 Generations of Terrestrial Commercial Wireless Systems

standards[2] were developed (or at the very least had a predominate focus) at the national level, the regional level, or the international level. National level organizations include organizations such as the Telecommunication Industry Association (TIA), American National Standards Institute (ANSI) Committee T1, etc. These organizations are sometimes referred to as the accredited Standards Development Organizations (SDOs).

At the regional level there are organizations such as the European Telecommunication Standards Institute (ETSI) which produces technical specifications. As shown in the lower portion of Figure 1, the first and second generations of commercial wireless standards/specifications were developed by national and regional standards bodies with a market place focus at the national and regional level.

As a result the first generation systems tended to be national in scope and therefore incompatible with each other. The second generation commercial wireless systems tended to be more regional in scope (e.g., the Global System for Mobile, GSM system, that was initially developed as a pan-Europe standard). It is important to note that as the market place evolved into a global market, these same technologies were refocused from a national/regional perspective to be "exported", often with the additional of new local variants to the standards (e.g, PDC an Asian market variant of IS-54 TDMA). The development of the third generation standards/specifications guided by the global requirements developed by the ITU-R were initiated by the national and regional standards bodies such as ETSI, TIA, and ANSI Committee T1 and other technology proponents in response to the ITU call for submissions. Harmonized versions were later adopted (after "consensus building") in ITU-R Recommendations thus giving these technical documents an international status and recognition. This is indicated by the slope in the middle of the graph on the lower portion of Figure 1. It was during this period (1997 - 2000) that the paradigm shift took place.

Going forward into systems beyond 3G, the standards community is starting with an international perspective in all aspects from market place requirements through the technology development cycle, including considerations of common global frequency bands and uniform international regulations. Having an international perspective at the start is important from the perspective of end users, service providers, and manufacturers. The key is a global design adapted to local market specifics as opposed to a local design being extrapolated into an international market place.

Overview of the Paradigm Shift

Fundamental changes have taken place in the requirements for international wireless telecommunications standards development and in the environment in which international standards are developed. In the past, the standards were driven by technology and engineering, were designed to meet the operating needs and requirements of the network operators and manufacturers, could be developed over the course of one or more ITU two- or four-year study periods, and tended to have a national or regional perspective. Today, standards are driven by the consumer and the marketplace, are developed with operators and manufacturers acting as surrogates for the end user, must be developed in very short periods of time to meet marketplace demands, and have a global perspective from the start.

The development of commercial wireless standards is an example of the change in the international telecommunications standards development environment and processes. The changing landscape of the commercial wireless standards development environment is summarized in Table 1 and will be described further in the following sections. Part of the change in commercial wireless standards development was precipitated by the establishment of the Partnership Projects and other fora. However, the underlying driver was the need for standards development organizations to be more responsive to marketplace needs. The marketplace requirement for the timely development of stan-

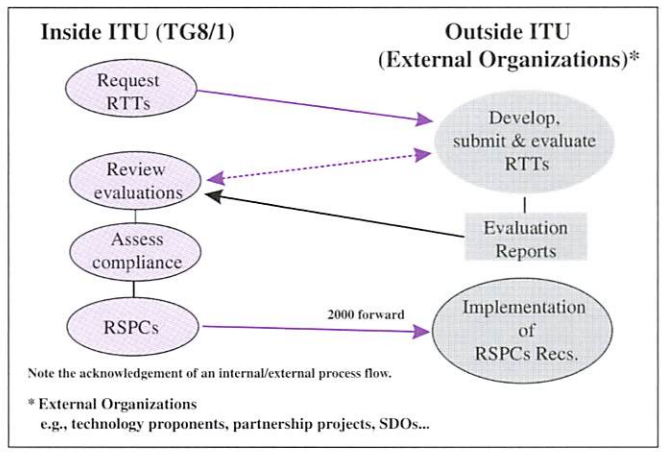


Figure 2 IMT-2000 Radio Interface Development Process 1997 through 1999

[2]There are two generally accepted usages of the word "standards" in the context of this paper. The first usage is a generic reference to any of the documents produced by a variety of different "standards" organizations such as recommendations from the ITU, technical specifications from organizations such as the Partnership Projects, and "standards" from recognized Standards Development Organizations (SDOs) such as TIA, ANSI Committee T1, etc. The second usage of the word is that associated with the documents produced by the SDOs which are recognized by standards accrediting organizations such as ANSI. These documents are actually called standards as opposed to specifications or recommendations.

	Historical Past	Recent Past	Current & Future
Drivers	Driven by technology and engineering.	Driven by requirements of the consumer.	Continues to be driven by the requirements of the consumer.
Customer Needs	Customer needs determined by the operators & manufacturers. Designed to meet needs of the operators and manufacturers (e.g., system capacity & coverage).	Operators and manufacturers act as surrogates for the end user requirements.	Many entities now function and act as surrogates for the end user requirements including content providers.
Perspective	National or regional.	Global perspective at the onset.	Global perspective in design is now the baseline; design for global marketplace and customize locally.
Technical Developments	Major technical standards inputs were predominately by manufacturers (often just one or at most a few).	Major collaborative effort of manufacturers, operators, service providers, SDOs and other proponents.	Major partnership effort of manufacturers, operators, service providers, SDOs and other proponents; more formalized and structured than previously.
Services	Before Internet; predominately voice; data was a minor consideration.	After Internet: data capability was a major thrust at the start.	Beyond Internet; major realignment of access, networks, etc. ... the "IPing" of systems.

Table 1 International Wireless Standards Development Landscape

dards that would accommodate the explosive changes in wireless technology was the reason that other international organizations came into being. However, this did not obviate the need for the International Telecommunications Union because of unique aspects of the ITU including the openness of the ITU's processes, the need to accommodate the special needs of the developing countries, and because of the stature of ITU recommendations in the international communications community. Further, the ITU-R is the centroid of international radio regulations related to the natural resource of wireless, that is spectrum.

The 1G and 2G Standards Landscape

The first and second generation of commercial wireless standards were developed by national and regional standards organizations. The 2G standards could be considered to be largely regional in scope. For example, the GSM specifications developed by ETSI were developed for the European region. It was only after the standards were developed, that the GSM standards were "exported" to other regions of the world including Africa, North America, and Asia. Similar statements can be made about the 2G standards developed in North America such as the standards for 2G CDMA and TDMA. These standards were developed from a North American perspective, but were later "exported" to other regions of the world.

The 3G and IMT-2000 Standards Landscape

The marketplace requirement for the timely development of standards was the genesis of the Partnership Projects and Technology Proponents as well as the subsequent changes in the RSPC (radio air interface specification)[3] recommendation development process. The development of RSPC was the start of the new paradigm in ITU-R Recommendations development because of the wide-scale use of normative references in this document. The unique use of references in RSPC as an integral part of this ITU-R Recommendation is the result of the pioneering relationships developed between ITU-R and External[4] Organizations as part of the RSPC development process.

The process developed and used by ITU-R in the creation of RSPC is depicted in Figure 2. This is a new process for international standards development. The process that was developed by ITU-R was designed specifically to provide a mechanism by which the ITU could be responsive to marketplace demands for Third Generation wireless systems and services. As shown in Figure 2, the ITU Task Group 8/1 generated a request for the submittal of radio transmission technologies to the relevant external organizations who were also requested to perform a self evaluation as to how well their proposed systems met IMT-2000 requirements previously developed by the ITU. These evaluations and the technical specifications themselves were reviewed by Task Group 8/1 and assessed for compliance with the ITU requirements previously published as part of the "M-Series" of documents on IMT-2000.

Figure 3 provides the time schedule used in the development of RSPC. Systems that implement this ITU-R Recommendation and the technical specifications and standards developed by the relevant external organizations are expected to become operational in early 2001.

Of critical note is the phase entitled "consensus building". One of the stated ITU-R design objectives of IMT-2000 was "that the number of radio interfaces should be minimal and, if more that one interface is required, that there should be a high degree of commonality between them." The movement that this engendered in the industry was the nexus of the paradigm shift, in that it forced the collaborative partnering development environment now in place both among the external organizations and with the ITU-R. Figure 4 depicts the IMT-2000 standards situation in the immediate timeframe after technology candidates were submitted but before any real movement toward consensus building. Figure 5 shows the collaborative consolidations and alliances

[3]RSPC was the initial informal name for ITU-R Recommendation M.1457, Detailed Specifications of the Radio Interfaces of IMT-2000 which was approved by the Radiocommunication Assembly in May 2000.

[4]The term "External Organizations" is used in this proposal to mean organizations external to the ITU such as the Third Generation Partnership Projects (3GPP and 3GPP2) and National and Regional Standards Development Organizations (SDOs) such as ANSI T1, ARIB, CWTS, ETSI, TIA, TTC, TTA, etc., and Technology Proponent organizations such as UWCC.

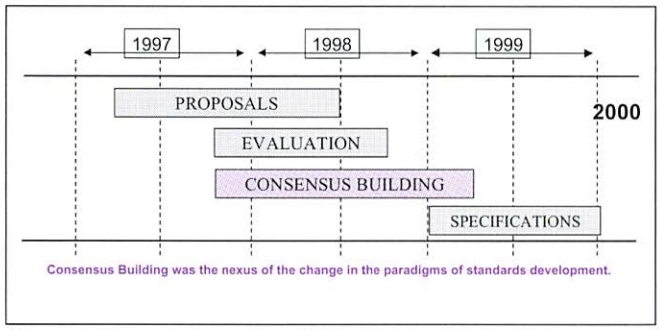


Figure 3 Time Schedule of ITU-R TG 8/1 IMT-2000 Standards Development Activities

that occurred when the recognition of a number of factors occurred among all involved parties. These factors included:

1) recognition of a global market,
2) understanding that a particular technology was strengthened by incorporation of the best design elements from many sources,
3) that in the short timeframes allocated, a distributed and parallel development approach was desirable,
4) that the development effort must be a combination of work by manufacturers, network operators, service providers and other stake holders, and finally,
5) the realization that to be commercially successful the family of radio interfaces for IMT-2000 must be the minimal set required to satisfy the diverse market place factors.

The ITU-R then compiled an extensive summary of all of the air interfaces and an extensive list of references to the technical specifications published by the Partnership Projects and the Technology Proponent (UWCC), and the standards published by the SDOs such as ARIB, CWTS, ETSI, T1, TIA, TTA, and TTC as delineated in the Recommendation M.1457.

From this we can now ascertain that the unique attributes of the RSPC standards development process included:

- Establishment of dynamic new relationships between the ITU and Relevant External Organizations
- Liberalization of the use of references in ITU Recommendations
- A new, fast-track process
- New roles for each of the major types of standards organizations:
  - The International Telecommunications Union
    - Radiocommunications Sector (the "R Sector")
    - Telecommunication Standardization Sector (the "T Sector")
  - Standards Development Organizations (e.g., ANSI T1, ARIB, CWTS, ETSI, TIA, TTC, TTA, etc.)
- And a place for collaborative entities and market focused organizations to rally as developmental stakeholders.
  - The Partnership Projects (3GPP and 3GPP2)
  - Technology Proponents(e.g., UWCC)
  - Market Organizations (e.g., GSM Association, OHG, etc.

The Future Standards Landscape - We Are in a New Era

Upon the completion of the ITU-R Recommendation M.1457, Task Group 8/1 was disbanded and a new organization (Working Party 8F) was created by ITU-R Study Group 8. This new working party was created in recognition of the fact that the marketplace will be demanding extensions to IMT-2000 systems and probably systems beyond IMT-2000 to accommodate need for even higher speed data and wireless access to the Internet, et. al. A key aspect of the future wireless standards development is that it will have an international aspect from the start and will also have in place a working cooperative, partnering, and synergistic relationship between the ITU and relevant external organizations at the onset. These future developments will build upon the foundation established and will refine the concept of partnering and extend the vision of consensus building.

Let us now consider a view of the future standards landscape for extensions to the ITU-R recommendations on IMT-2000 and for systems beyond IMT-2000. The international standards development process for IMT-2000 and systems beyond IMT-2000 can be viewed as a 4-sides of a pyramid (Figure 6 shows each represented side). Moving from the base to the tip on each of the four sides provides a national to regional to international perspective as shown in Figure 6. The four sides of the pyramid are:

- Market place
- Spectrum

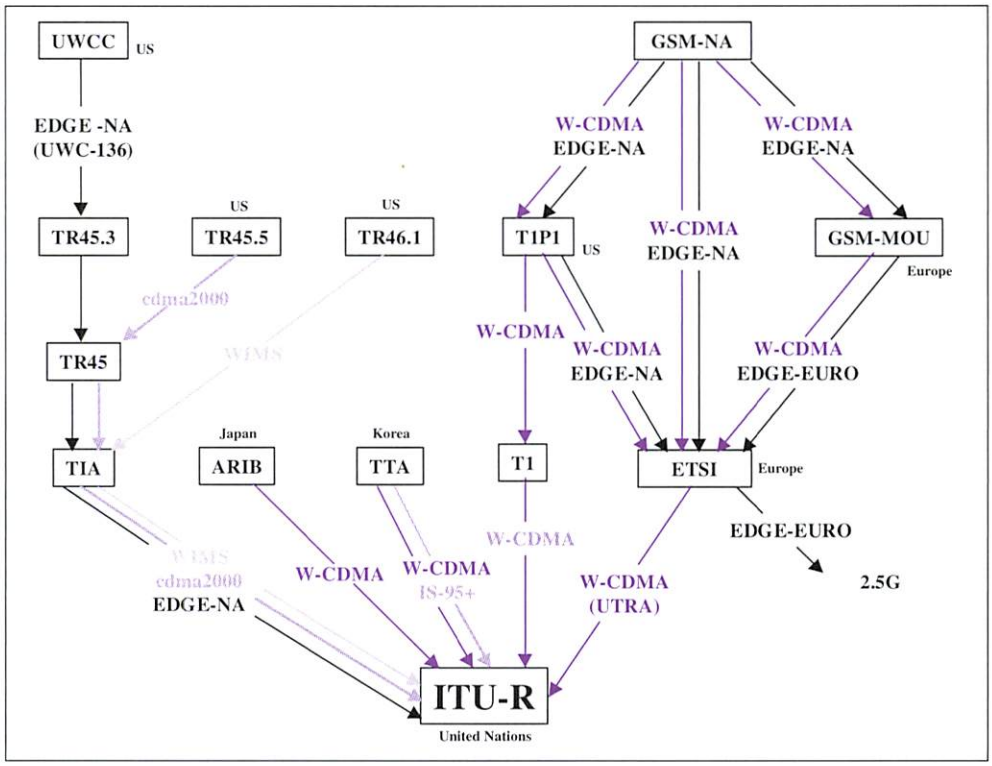


Figure 4 3G Terrestrial Standards Development in 1998 Prior to Consensus Building Activities

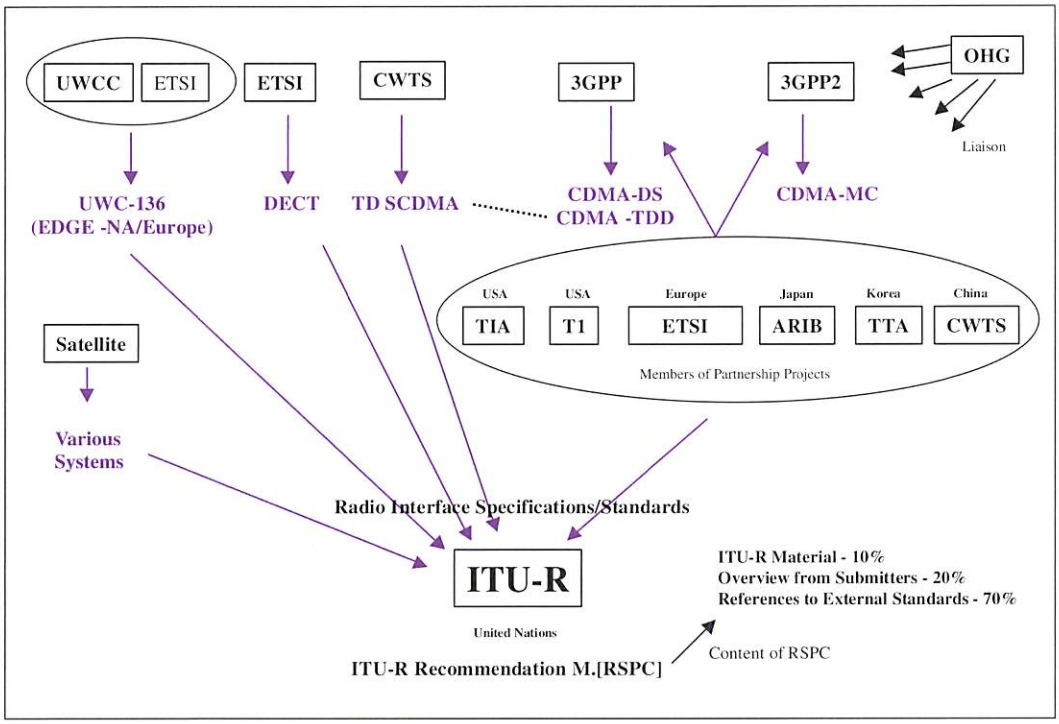


Figure 5 IMT-2000 Standards Development Partnering and Consensus Building in 1999

- ✦ Regulatory
- ✦ Technology

The common meeting point for three of these four faces of the pyramid is the ITU. The three interrelated factors, that come together globally only at the ITU, are the Spectrum (the natural resource of wireless), the Regulatory (the authorization to use the natural resource), and the Technology (the mechanism to put the natural resource to work). Details of the "Technology Face" of the pyramid are also shown in Figure 6. Note in this that the base is the "Marketing Organizations" which provide market drivers and requirements. The national and regional standards development organizations and the Technology Proponents and Partnership Projects are in the middle of the pyramid and they develop the technical specifications and standards in coordination with both sectors of the ITU.

One of the key differences between the model used for "systems beyond IMT-2000" and the model used for the initial version of IMT-2000 is that the communication and coordination process between the ITU and the relevant external organizations are in place at the onset rather than being put in place at the end which was the case for the first version of IMT-2000. This is important because it allows for the cohesive development of requirements between the ITU and the relevant external organizations.

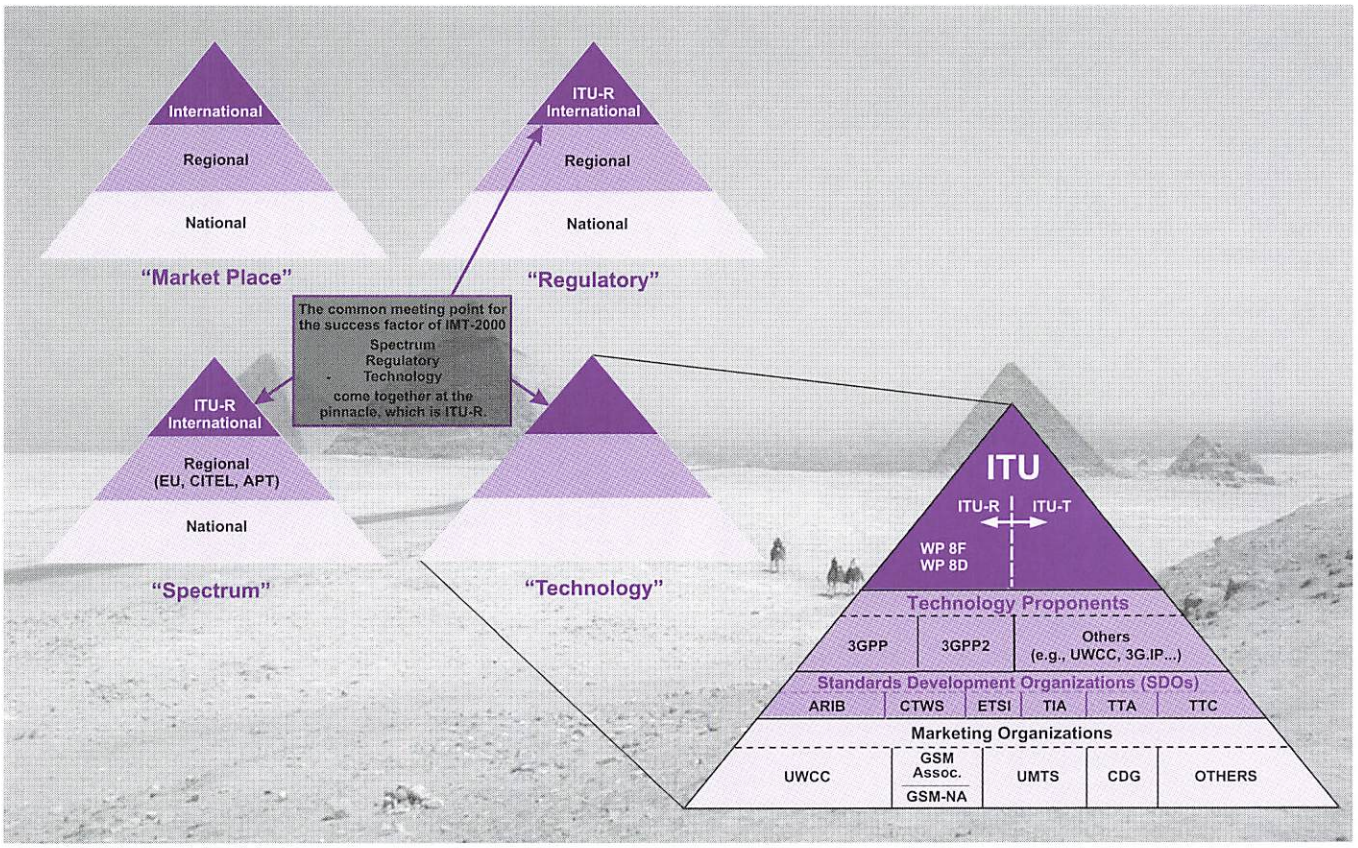


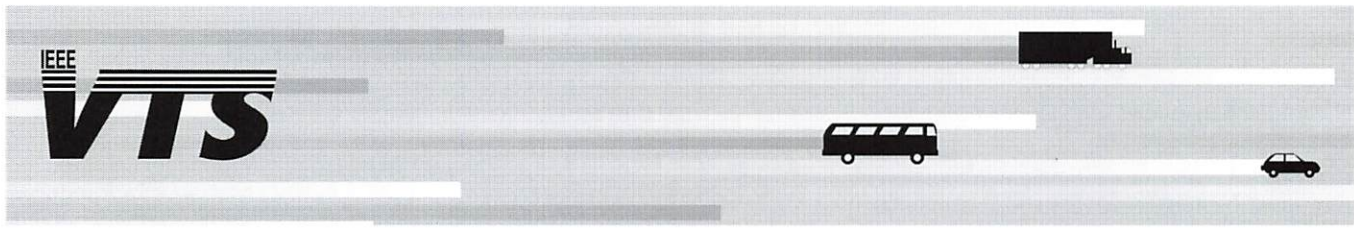
Figure 6 The Pyramid Model of IMT Standards, with details of the technology side on the right

and is responsible for the IMT-2000 TDMA Single Carrier air interface (also known as UWC-136 which is specified by American National Standard TIA/EIA-136). The UWCC and the GSM Association have developed agreements for joint development of TDMA technologies such as EDGE.

More information on UWCC may be found at:
http://www.uwcc.org/

Market Organizations

The CDMA Development Group (CDG), the GSM Association, and the UMTS Forum are among the organizations that may be considered to be organizations that are primarily technology market organizations for 3G wireless systems. The Universal Wireless Communications Consortium functions as a market organization as well as a technology proponent responsible for the development of technical specifications for UWC-136. Although these market organizations (with the exception of UWCC) do not develop specifications or standards per se, they have tight relationships with the Partnership Projects and technology proponents that do develop such materials.



VEHICLE INFOTRONICS - THE DRIVER ASSISTANT APPROACH

Peter Anders and Rüdiger Prang, Vokswagen AG

Editor's Note: Thanks are extended to the Convergence Transportation Electronics Association for permission to reprint this article from its Convergence '98 Proceedings. The Convergence Transportation Electronics Association is an organization dedicated to the advancement of transport electronics technology and the support of mathematics and science education.

A new approach to improve the driver's safety is to actively support the driving task and prevent possibly dangerous situations. This paper is about the family of Driver Assistance Systems which will combine three steps of information processing:

- *Automatic collection of data by scanning the environment of the vehicle*
- *Automatic processing of data according to the need of the driver and his driving task*
- *Appropriate presentation of valuable information to the driver*

Electronic sensor systems will enlarge the driver's knowledge about what is actually going on around his vehicle. These systems expand the human sensor systems eye and ear for the special purpose "safe driving".

Introduction

The driver's comfort highly influences the safety of his manoeuvres. Well-being and absence of fatigue are necessary in the dense traffic of today. Many modules for the vehicle have been developed to support the driver. Among these is the support in the darkness with the high beam and an illumination of high quality, the servo assisted steering to improve parking and curving, the anti locking system to shorten the time to come to a standstill in emergency situations.

The automobile industry will continue to improve the support for the driver. Several investigations [1,2,3] prove the necessity to

- Increase the perception of critical situations
- Support the reception of important information
- Speed up the time to take an adequate action

Driver Assistance Systems

Driver Assistance Systems are another step to increase the safety and the comfort of driving. The approach is to actively support the driving task and prevent possibly dangerous situations [4]. Often a good hint from a passenger makes the driver watch out for possible collision parties in the righthand direction. A passenger is not always present, and even if a passenger is present, he may not be alert.

A Driver Assistance System will be constructed to pass information similar to an alert and sensible passenger. The Assistance System will be alert always. It will automatically scan the environment of the vehicle and collect information about objects nearby. For example it will collect distance, velocity and heading of each passing object. The Driver Assistance System will pass those parts of the information to the driver, which are important during the actual state of the vehicle and its environment. Similar to a sensible passenger, the Driver Assistance System will not distract the driver's concentration, but will pass the necessary information in time for the driver to react.

The Driver Assistance System will present information conditional on the traffic situation and the intended action of the driver. This implies the necessity to get certain informa-

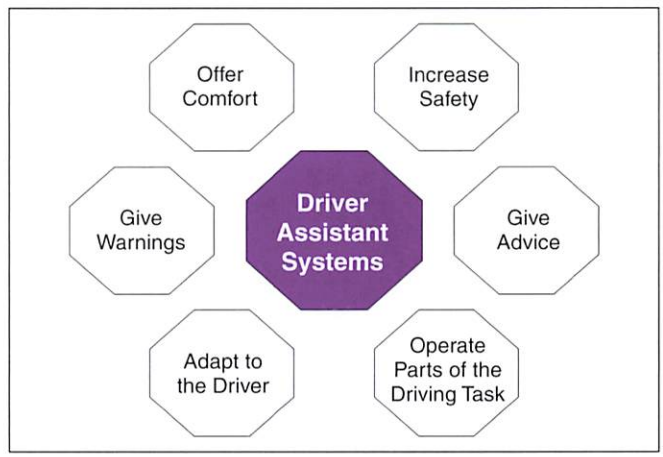


Figure 1 Functionalities of Driver Assistant Systems

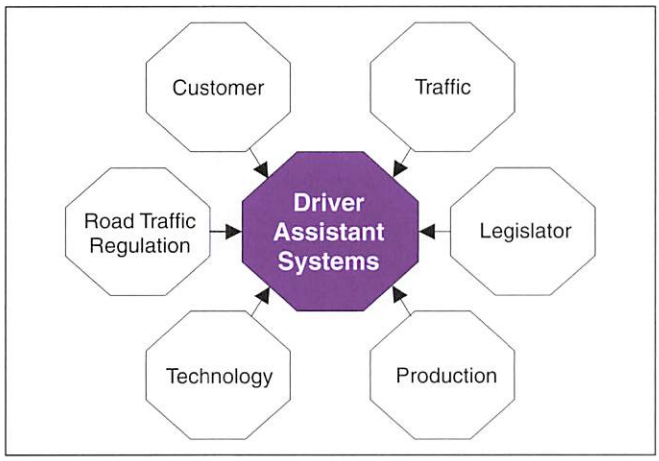


Figure 2 Interactions with Driver Assistance Systems

tion about the driver's intentions. The Driver Assistant System must be able to extract the driver's intention about the vehicle manoeuvres out of the vehicle's data like the course of the driven speed, the steering angle and the indicators. A sensor observing the movements of the driver's eye can help to discover the driver's awareness of a critical object.

Figure 2 shows the interactions on Driver Assistance Systems. The matter of inspection by the road traffic authorities must be cleared. The question of responsibility in case of an accident must be settled together with the legislator. The demands of the customer must be considered to offer good comfort and support. The addressed traffic situations must be analyzed to increase the safety of the road users. Among the available technology the best sensors must be used to produce systems of good quality and high reliability.

Systems for Driver Assistance

A short description of some systems for driver assistance is given below. Within the section 'Primary Area of Interest' a description of the surrounding area of the vehicle is given.

Blind Spot Detection

The blind spot detection system will observe the areas on the near side and the near back of the vehicle, [5,6]. This system will detect objects in the blind spot zone, as indicated in the picture above. These objects cannot be seen in the inside or the outside rear-view mirrors, if concave mirrors are used. Usually the driver covers this area by turning his head left and looking across his shoulder. This is somewhat uncomfortable. Especially a handicapped person with a limited field of view can be given assistance by the blind spot detection.

Lane Change Assistant

The lane change assistant will cover the areas near front, side and rear and the far front and rear of the vehicle. Among the Addressed accident situations is the wrong estimation of

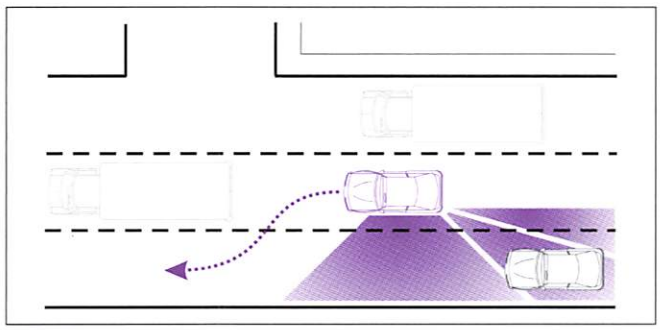


Figure 4 Lane Change Maneuver

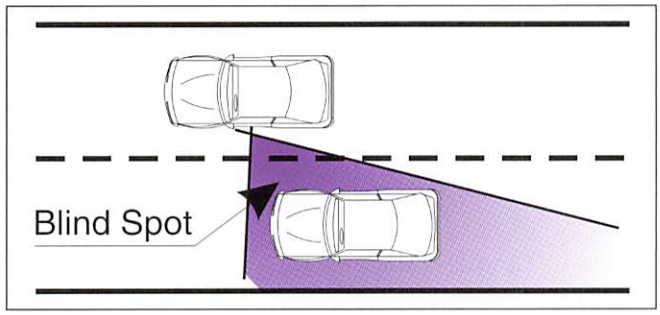


Figure 3 Blind Spot Zone

distance and velocity of vehicles approaching in the back on the adjacent lane. On rural roads the same mistake can be made concerning vehicles approaching in the front.

The lane change assistant includes the blind spot detection and adds a long distance detection.

Road Departure Warning

This system covers the areas near front and side of the vehicle and warns the driver about unintended road departure [7]. This can happen due to drowsiness of the driver or due to insufficient illumination of the road.

Lane Keeping Assistant

The lane keeping assistant is a counterpart of the lane changing assistant. It covers the areas near front and side of the vehicle and includes the road departure warning. Lane keeping support is important at roadworks and in the twilight.

Turn Assistant

The turn assistant covers the areas near front, side and rear of the vehicle. Among the addressed accident situations is the turning of a vehicle and missing a crossing pedestrian, or estimating the velocity of a bicycle wrong. These situations include unequal road users and accidents among unequal road users cause bad injuries. This system is of interest mainly in town.

Adaptive Cruise Control

The Adaptive Cruise Control covers the near and far front area of the vehicle. It adds comfort to driving and prevents accidents due to wrong estimation of distance and velocity of vehicles in front. It includes the control of the vehicle lengthwise.

Park Assistant

This adds comfort to parking in estimating available parking space and supporting the way of parking. Vehicles tend to have areas which are not observable for the driver and accidents while parking may cause expensive bodywork damage. The park assistant will also help to attract the driver's attention to otherwise overseen approaching pedestrians.

Adaptive Light Assistant

The Adaptive Light Assistant will control the lights of the vehicle according to the traffic situation [8]. For example,

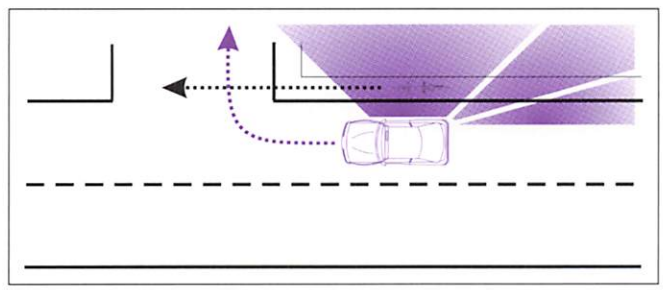


Figure 5 Turn Manoeuvre

Figure 7 shows the process as envisioned by the Chair of ITU-R Working Party 8F for the international partnering for the future development of requirements, specifications, standards and recommendations. It is the view that this is the process that should be used for "systems beyond IMT-2000". Note the large amount of interaction between the ITU and the relevant organizations from market requirements development, establishment of principles, frameworks and technical requirements, through actual development of the technical specifications, standards and recommendations. In other words, the interaction is throughout the process, not just at the end of the process as was the case for the original version of the IMT-2000 standards.

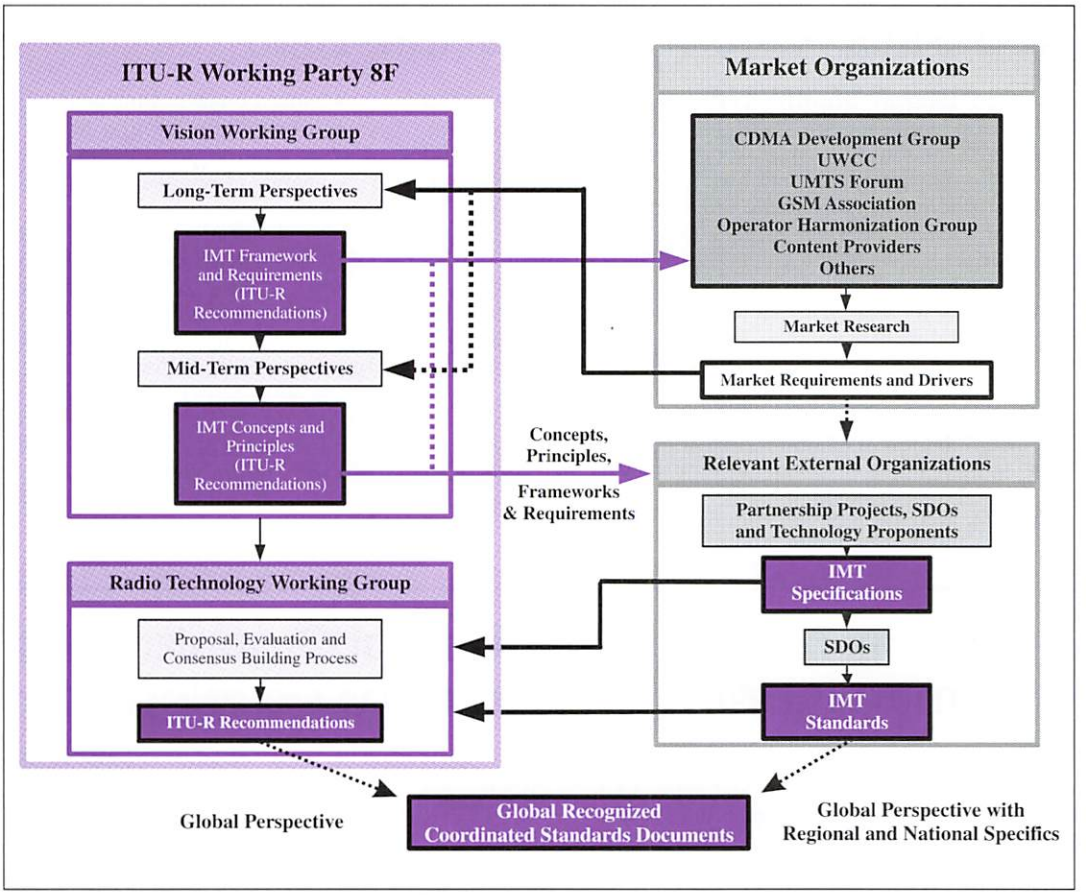


Figure 7 Organizations and Process for International Partnering in Development of IMT Requirements, Specifications, Standards, and Recommendations

Summary and Conclusions

The standards process for commercial wireless has changed permanently. We have entered a new era in the development and evolution of complex systems that must meet the demanding requirements of a consumer focussed global market place. These systems must leverage a technology base offering common solutions customizable at the application level. To succeed in this environment it is necessary to recognize the following:

- There is no more "local only" marketplace - global focus is the driver.
- The world of international standards has permanently changed.
- Continued rapid changes in the communications marketplace and in technology dictates the need for a "new way of doing business" in standards development including a plethora of new specialized specifications development "fora" created by the communications industry.
- ITU-R has successfully developed and used a new model for standards development in this brave new world of dynamic changes in communications technologies, multiple **international** standards development organizations, and increased globalization.
- This model works for IMT development now and into the future.
- This model is applicable to other standards development outside the ITU-R.
- Efficient work management and coordination is the prime concern not organizational structure.

Acknowledgements

I am indebted to Mr. James Hoffmeyer for his contributions to this article.

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James A. Hoffmeyer *is President of Western Telecom Consulting, Inc. He is currently under contract to BellSouth Cellular and is involved in activities within ITU-R and ITU-T for IMT-2000. He is the rapporteur appointed by WP 8F to liaison between WP 8F and the ITU-T on IMT 2000. Mr. Hoffmeyer is also working on spectrum issues associated with IMT-2000.*

Appendix A - Overview of IMT-2000

International Mobile Telecommunications-2000 (IMT-2000) systems are third generation mobile systems which are scheduled to start service around the year 2000 subject to market considerations. They will provide access, by means of one or more radio links, to a wide range of telecommunications services supported by the fixed telecommunication networks (e.g. PSTN/ISDN/IP), and to other services which are specific to mobile users.

A range of mobile terminal types is encompassed, linking to terrestrial and/or satellite based networks, and the terminals may be designed for mobile or fixed use.

Key features of IMT-2000 are:

- high degree of commonality of design worldwide;
- compatibility of services within IMT-2000 and with the fixed networks;
- high quality;
- small terminal for worldwide use;
- worldwide roaming capability;
- capability for multimedia applications, and a wide range of services and terminals.

The air interfaces of IMT-2000 systems are defined by a set of interdependent ITU-R Recommendations. (Network aspects of IMT-2000 systems are being developed by the Telecommunication Standardization Sector of the International Telecommunication Union (ITU-T)). While the current list of ITU-R Recommendations on IMT-2000 is extensive, several such as Recommendations M.1034 (requirements), M.1225 (radio interface definitions), M.1455 (key characteristics of the air interfaces), and M.1457 (detailed specifications of the air interfaces) are particularly significant to terrestrial commercial wireless systems.

Appendix B - Relevant External Organizations for Commercial Wireless Standards Development

There are numerous organizations that develop standards and technical specifications for commercial wireless applications. The organizations most relevant to the ITU-R Working Party 8F process for developing recommendations on IMT-2000 and systems beyond IMT-2000 are described below. Other organizations may appear as progress is made on the "Beyond" portion of IMT-2000 and Beyond.

Third Generation Partnership Project (3GPP) This organization is an international organization based on the partnership between several regional and national organizations. The procedures of the Partnership Project are agreed between the partners but, as far as possible, are founded on those of the bodies involved. The Project's results will normally be published as technical specifications that may be adopted as formal standards by any of the partners. The 3GPP is responsible for

1) the technical specifications for the IMT-2000 CDMA Direct Spread air interface (also known as W-CDMA, and as the Universal Terrestrial Radio Access (UTRA) Frequency Division Duplex),
2) IMT-2000 CDMA TDD (also know as TD-SCDMA and as Universal Terrestrial Radio Access (UTRA) Time Division Duplex), and
3) or the evolution of GSM.

There are two types of partners in the 3GPP: Organizational Partners and Market Representation Partners. The organizational partners are the following regional/national Standards Development Organizations (SDOs):

- Association of Radio Industries and Businesses (ARIB), Japan
- China Wireless Telecommunications Standard (CWTS) Group, China
- European Telecommunications Standards Institute (ETSI), Europe
- Standards Committee T1, Telecommunications, United States
- Telecommunications Technology Association (TTA), Korea
- Telecommunications Technology Committee (TTC), Japan

The Market Representation Partners of 3GPP are the Universal Mobile Telecommunications System (UMTS) Forum, the Global Mobile Suppliers Association (GSA), and the GSM Association.

An overview of 3GPP may be found at
www.3gpp.org/About_3GPP/3GPPdesc_copenhagen.ppt

Third Generation Partnership Project 2 (3GPP2) 3GPP2 is an effort spearheaded by the International Committee of the American National Standards Institute's (ANSI) board of directors to establish a 3G Partnership Project (3GPP) for evolved ANSI/TIA/EIA-41, "Cellular Radiotelecommunication Intersystem Operations" networks and related Radio Transmission Technology (RTTs). The 3GPP2 is responsible for IMT-2000 standards known as IMT-2000 CDMA Multi-Carrier (this radio interface is also know as cdma2000). The regional/national Standards Development Organizations that are members of 3GPP2 are:

- Association of Radio Industries and Businesses (ARIB), Japan
- China Wireless Telecommunications Standard (CWTS) Group, China
- Telecommunications Industry Association (TIA), North America
- Telecommunications Technology Association (TTA), Korea
- Telecommunications Technology Committee (TTC), Japan

Note that four of the organizations listed are also members of 3GPP. More information on 3GPP2 may be found at:
http://www.3gpp2.org/

Universal Wireless Communications Consortium (UWCC) The UWCC is known as a technology proponent

when taking left or right curves, the respective area of interest is illuminated better. This extra light makes objects detectable by the driver, which otherwise may be hard to observe. The Adaptive Light Assistant adds safety and comfort to driving.

Primary Area of Interest

The members of the Driver Assistant family can be distinguished according to their primary area of interest (see Figure 6).

The following table gives an overview about different Driver Assistant systems and their primary area of interest.

The individual systems mentioned in the table need a detailed description, which is given in the preceding section. The table shows that most systems have their Primary area of interest in the near front and the near Side, some have interest in the near rear. Two systems need information about the far front, one needs information about the far rear end. No system needs information about the far side.

	Front		Side		Rear	
	Near	Far	Near	Far	Near	Far
Lane Change	X	X	X		X	X
Lane Keeping	X		X			
Road Departure	X		X			
Blind Spot Detection			X		X	
Turn Assistant	X		X		X	
ACC	X	X				
Light Assistant	X	X	X			
Park Assistant	X		X		X	

The sensor systems scan their areas of interest around the vehicle with the technologies

- Video
- Radar
- Laser or
- Ultrasonic.

Either one sensor only is used or a combination of sensors. A combination may consist of an array of sensors of the same technology or of sensor's of different technologies. Arrays of sensors are advantageous in terms of redundancy and error detection, but have disadvantages in cost terms.

Error Classes of Object Detection

It is necessary to keep track of errors of detected objects. The detection system must have a permanent mechanism of self control. In case of serious errors the system must inform the driver and turn itself into an error control mode.

An object detection is called 'positive message'. Looking at classes of errors, one can distinguish:

- Missing positive message
- Wrong positive message
- Correct positive message, but too early
- Correct positive message, but too late
- Superfluous positive message

The most severe errors are missing positives and too late positives. These messages may cause accidents if the driver relies upon the misleading security. These kind of errors must not occur.

Wrong positive messages and too early positives are bad, but will not cause accidents. These messages bother the driver and distract his concentration without necessity, but they do not suppress existing objects. These kind of errors must be minimized.

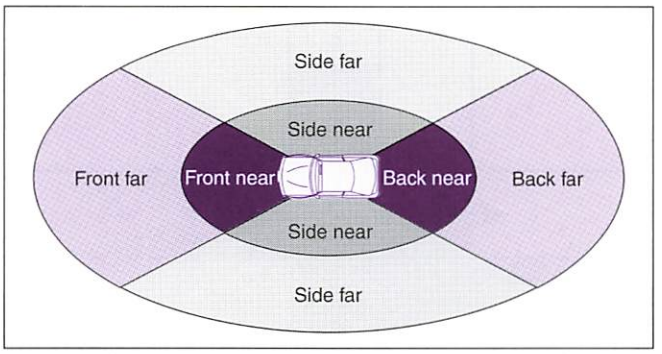

Figure 6 Classification of the surrounding area of the vehicle

Superfluous positive messages are correct positive messages, but are annoying and distract drivers' attention. Such objects take actions which will take them out of the area of interest. For example, a car in the right lane decelerates, parks and is then no longer relevant to a lane changing vehicle on the left lane. This sort of superfluous message can be sorted out only by keeping track of the intention of adjacent road users.

Joint Resources

As can be seen in the section 'Primary Area of Interest' above, some Driver Assistant Systems may share the same sensors. For example, the Lane Keeping Assistant and the Road Departure Assistant both need information about the near front and the near side of the vehicle. Both Assistance Systems are designed to describe rather similar objects: the course of the lane or the course of the road. The customer will appreciate the combination of the two functionalities.

Also the same Human Machine Interface (HMI) may be shared among different Driver Assistant Systems. This is important since available appropriate space in the vehicle is limited. But the HMI must be designed careful not to confuse the driver. A HMI signal must not change its meaning. Taking again the above mentioned combination of Road Departure Warning and Lane Keeping, the warning for road departure will also be a warning for lane departure. The nature for both signals is the same and they may share the same HMI signal.

Requests of the Traffic Situation on Driver Assistant Systems

The detection area of the underlying sensor system is significant when designing a driver assistant system. The sensor system must meet the requirements of the addressed traffic situations and each traffic situation has its special requests. The example of the Turn Assistant will be used to introduce the basic concept.

First the addressed traffic situations must be laid down, see Step 1 below. Next the necessary range of the sensor system must be analyzed, see Steps 2 to 4 below. In Step 5 the distribution of the direction of different ranges is decided on. Step 6 is a repetition of Steps 2 - 5 for all the important addressed traffic situations and a combination of all resulting requirements.

Step1: Addressed Traffic Situation

One must lay down the most important traffic situations for the addressed Driver Assistant System. Criteria for this investigation can be

- Number of accidents
- Frequency of traffic situation
- Results of marketing research.

For the example of the Turn Assistant among the addressed traffic situations will be

- Turn with oncoming traffic
- Turn with pedestrians crossing

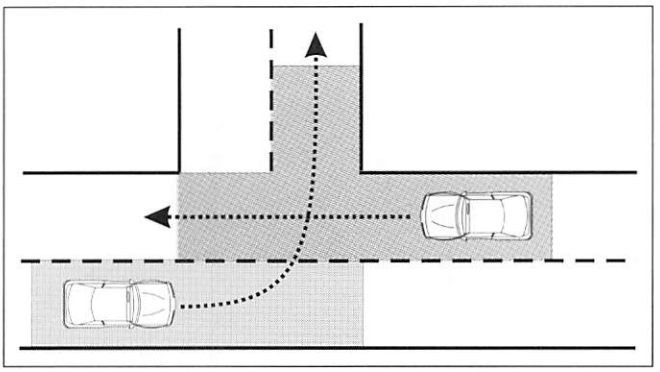

Figure 7 Zone of conflicts when turning left

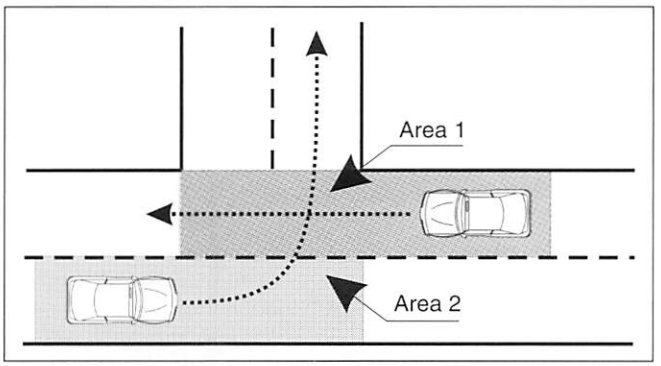

Figure 8 Areas for lining up

✦ Turn with bicyclists crossing.

The next steps 2 - 5 must be repeated for every traffic situation considered important. We will restrict the example on the situation 'Turn with oncoming traffic'.

Step 2: Time To Cross The Zone Of Potential Conflicts

The Driver Assistant System must give information in time for the driver to react. So the first threshold to consider is the reaction time of the driver. We consider 1.8 s as the first time limit.

The next basic time to consider is the time to drive through the area of potential conflicts. Within our example, Turn left, we do not know how the driver will perform his turn. So our concept must consider all possible, but still likely conflict positions, which sum up to the zone of conflicts, see illustration 7.

Within this area, we must consider the longest, but still likely driveway. Next we must assume a vehicle speed for this driveway. To take the safe side, we must calculate with a low, but still likely speed.

The two parameters 'longest driveway through the conflict zone' and 'low but likely speed' give a length of time which we call the 'period of potential conflicts'.

But there is another dimension to consider. That is the geometry of the road. To be on the safe side, we must consider the road geometry which will result in the longest period of potential conflicts. Within our example, there may be three oncoming lanes and there may be three target lanes. As a result, there is a longer driveway through the conflict zone and a longer time to consider.

Step 3: Speed of Potential Opponent

To get a safe estimation, we must consider the fastest, but still likely speed of a potential opponent. In town, for example, the legal speed limit is 50 km/h in Germany. But many drivers go over that limit. So, the speed in town to consider should be 65 km/h rather than 50 km/h.

Step 4: First Estimation of Range Of Sensor

The results of step 2 and 3, estimation of crossing time and estimation of opponent's speed, give a safe estimation of the necessary range of the system's sensor for the particular traffic situation 'Turn left on a three lane crossing with oncoming traffic'.

Step 5: Direction of the Range

The road geometry, which was mentioned in step 2 already, and the range of the system's sensor form an area of possible locations for potential opponents, see area 1 in Figure 8.

Area 2 is the area where the driver of the equipped vehicle decides to go for the turn or to slow down his car and wait for the oncoming traffic to pass. The combination of both areas 1 and 2 form the necessary distribution for range and direction of the detecting sensor system.

Step 6: Combination of Requirements of Different Traffic Situations

The steps 2-5 must be repeated for all traffic situations considered important in step 1. The results must be superposed. In the end, the result is the detection area which meets the traffic requirements for the particular Driver Assistant System.

Summary and Conclusion

This paper gave an overview on the family of Driver Assistant Systems and introduced some of its members. The example of the Turn Assistant was chosen to show the basic requirements of traffic situations on the range of sensor systems. Driver Assistant Systems offer the opportunity to increase comfort and safety for the driver. Each Driver Assistant System must be reliable and understandable to the customer.

It will be work of the future to find out which systems or combination of systems the customer appreciates most. It is our task to offer high benefits for a reasonable price. We will press ahead with our customer driven development.

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IEC 61375-1 and UIC 556 – International Standards for Train Communication

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The communication system within a train is a central issue for train system integration. Historically, there have been numerous, proprietary and non-interoperable solutions. IEC 61375 and UIC 556 have now been issued as a set of international standards to over-come this situation: IEC 61375, the Train Communication Network (TCN), defines a communication architecture and the necessary protocols for non-vital communication on train and on vehicle level. It consists of a two-layered, hierarchical architecture to suit the needs of inter- and intra-vehicle communication. UIC 556 and the accompanying UIC codes define the operator's view on the train, the frame-work for the coordination of the different applications and the operational handling to ensure interoperability between vehicles from different manufacturers.

This protocol suite has been successfully explored in operational test trains as well as in large number of actual running projects for DMUs, EMUs, high-speed trains, locomotives, passenger trains, suburban trains, as well as trams. It is used for new vehicles and for vehicle refurbishment.

The article focuses on the TCN and UIC standards, their development and application in actual projects.

I. TCN Development

In 1988, IEC Technical Committee 9 founded Working Group 22 to standardize a common train communication network for railway applications. In parallel (1990-1996), a Joint Development Project (JDP) was founded by several rail system suppliers (ABB, AEG, Firema, Siemens) to jointly develop a common prototype for such a communication system and prove the feasibility of the concept. The output of this project was a reference implementation of hardware and software for a TCN network and a laboratory test bed to verify and to tune the behavior.

In 1994/95, the devices developed were used in an ERRI test train running in regular operation between Interlaken, Switzerland and Amsterdam, Netherlands. The tests were executed by the "Industriegruppe Zugbus" (IGZ:ABB, AEG, Firema, Holec, Siemens) and were used to further improve TCN in regular operation. In October 1999, TCN became International Standard (IS).

The work on standardizing the application level was done in parallel to the development of the TCN system, and UIC code 556 was passed in June 1999.

II. Train Communication Network (TCN)

The TCN has been standardized by IEC (IEC 61375-1) and by the IEEE (Std 1473-1999 IEEE Standard for Communications Protocol Aboard Train)[1].

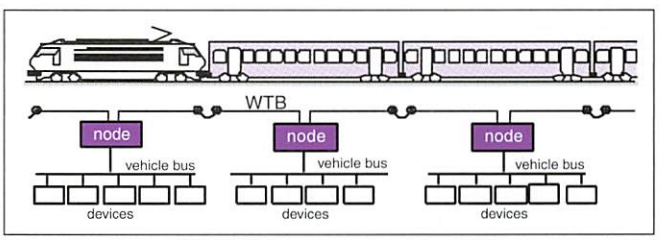

Figure 1 Physical architecture of the TCN

General Architecture

The architecture of the TCN addresses all relevant topologies used in rail vehicles. It comprises two levels, the *Wire Train Bus* WTB connecting the vehicles and the *Multifunction Vehicle Bus* MVB (or optionally another vehicle bus) connecting the equipment aboard a vehicle or group of vehicles (figure 1).

A vehicle may be equipped with one or several vehicle busses. A vehicle bus may span one or several vehicles as in the case of mass-transit train-sets (MUs) which are not separated during operation.

To cope with a variety of coaches and equipment, TCN uses logical addressing: every node of the train bus is expected to support a number of application *functions* which are each accessible by a unique function number. The vehicle's internal hardware infrastructure must therefore not be known.

Each function may be executed by one or by several devices or by the train bus node itself; and each device may execute multiple functions. From the outside, it looks as if the (WTB) node would be executing all functions itself; the internal structure is invisible from the outside.

Multifunction Vehicle Bus (MVB)

The Multifunction Vehicle Bus (MVB) has been specified as the vehicle bus that connects equipment on-board vehicles and between vehicles in a closed train-set.

The MVB operates at 1.5 Mbit/s over three media:

- RS-485 for short distance (Electrical Short Distance Bus, ESD for up to 20m and ESD+[2] for up to 200 m)
- transformer-coupled twisted wire pairs for up to 200 m (Electrical Middle Distance Bus, EMD);

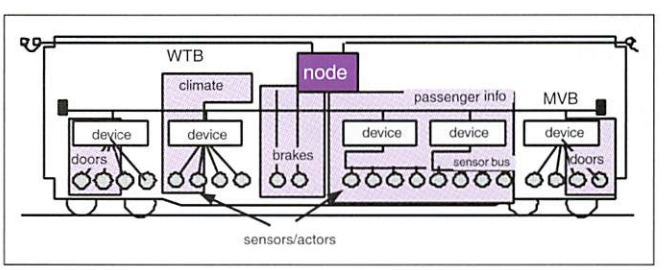

Figure 2 Logical architecture of the TCN

[1]IEEE 1437 defined TCN in a bundle with LON

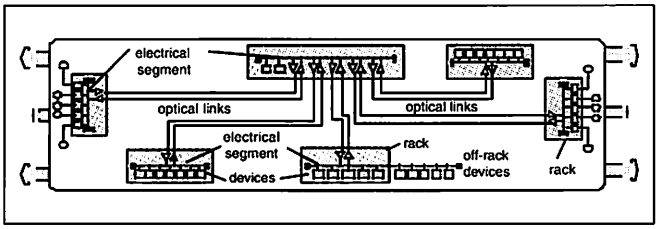

Figure 3 MVB layout in a locomotive using fiber optics and electrical medium

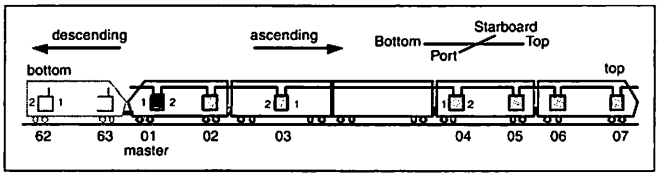

Figure 4 Train bus nodes and vehicles

- ✦ optical fibers for distances up to 2000 m (Optical Glass Fiber, OGF), especially to be used in EMC harsh environments.

The different media can be interconnected directly with repeaters. The introduction of the vehicle bus allows to reduce considerably the amount of cabling and to increase reliability.

The MVB is controlled by a dedicated bus master which may be backed up by redundant masters to increase availability. The MVB is supported by an integrated bus controller (MVBC) which allows to build simple devices without a processor. This chip provides line redundancy at the physical layer: a device transmits on both redundant lines but listens to only one while monitoring the other. The MVB provides high integrity against data falsification. Because of its robust Manchester encoding and its checksum, it fulfils the IEC 870-5 FT2 class (HD = 8).

class 0	repeaters, bus couplers and optical star couplers
class 1	simple actors and sensors which offer the capability to read the device status and to send/receive process data. Typically they possess no application processor (only the bus controller).
class 2	intelligent input/output devices with application processor, but fixed application program (can only be configured). Support process data and message data.
class 3	intelligent programmable devices. Support process data and message data.
class 4	like class 3, but with bus administrator in addition and not necessarily programmable
class 5	like class 3, but with WTB gateway capability addition and not necessarily programmable

Table 1: MVB device classes

Wire Train Bus (WTB)

For trains which frequently change composition (such as international UIC trains or suburban trains), the Wire Train Bus (WTB) was designed to interconnect vehicles via hand-plug jumper cables or automatic couplers. For cabling, a shielded twisted wire pair carrying data at 1 Mbit/s is defined which may be redundant[3].

[2]The ESD+ bus uses the ESD characteristics but with galvanically isolating interfaces (opto-couplers).

[3]UIC requires redundant cabling.

The WTB allows to cover 860 m (which corresponds to 22 UIC vehicles without repeater) and to connect up to 32 nodes. Considering the harsh environment and the presence of connectors and discontinuities on the bus, a digital signal processor is used for decoding the Manchester signal (e.g. the MITRAC AMED chip). To clean connector contacts which may be oxidized, a fritting voltage may be superimposed.

The most salient feature of the WTB (and unique in industry) is its capability of auto-numbering the nodes in sequential order and to let all nodes recognize which is the right or left side of the train. Each time the train composition changes, e.g. when adding or removing vehicles, the train bus nodes execute the *inauguration* procedure which connects the nodes electrically and assigns each node its address.

Train bus nodes are numbered sequentially. In general, there is one node per vehicle. But there may be more than one node per vehicle or none at all (figure 4).

At the end of the inauguration, all vehicles are informed of the WTB topography, including:

- ✦ their own TCN address, orientation (right/left), and position (after/before) with respect to the master.
- ✦ the number and position of the other nodes in the train.

Additionally, user defined information may be appended that informs about

- ✦ type and version (locomotive, coaches...) of other vehicles and supported functions
- ✦ permanent and dynamic properties of the vehicles (e.g. presence of the driver)

For example, UIC defined such user information in [UIC556] (refer to section III).

The inauguration procedure is complex since it does not only care for correct numbering and identification of the nodes but also for the transition between low-power sleep mode to active mode. To allow a fast recovery in the event of bus disruption, every node has the ability to become bus master. In such an event, mastership is automatically transferred to a neighboring node.

Common Real-Time Protocols (RTP)

WTB and MVB differ in physical and link layer. But with respect to higher layers and especially to user interfaces, both obey to the same protocols which are called *Real Time Protocols*. This paragraph outlines the RTP's principles:

Data Traffic

The TCN provides two types of data service:

1) **Process Variables** which reflect the train's state like speed, motor current, operator's commands. The transfer time for Process Variables must be short and deterministic. To guarantee this delay, Process Variables are transmitted *periodically*.
2) **Messages** carry infrequent but possibly lengthy information, e.g. diagnostics or passenger information. Message length varies between a few octets and some

WTB	MVB
up to 860 m	up to 200 m / 2000 m
auto-configuration	fixed configuration
orientation detection	no orientation
relative addressing	absolute addressing
up to 32 nodes	up to 256 stations
1.0 Mbit/s	1.5 Mbit/s
25 ms cycle time	1 ms cycle time

Table 2: summary of WTB and MVB characteristics

kilo-octets. The transmission delay of messages must be short, but variations are permitted. For this reason, messages are transmitted *on demand*.

Periodic and Sporadic Medium Access

The periodic (process data) and sporadic (messages) data traffic share the same bus but are treated separately in the devices. All busses pertaining to the TCN are expected to provide these two basic data services. The periodic and sporadic transmission of data is controlled by one device acting as master. This guarantees deterministic medium access. To this effect, the master alternates periodic phases and sporadic phases:

The periodic phase occupies a fixed slot of the bus time. During that time, the master polls variables in sequence. Periodic data is associated with transmission of states and need not to be acknowledged by the destination(s) since they are periodically retransmitted. The basic period is either 1 ms or 2 ms on the MVB and 25 ms on the WTB. Less urgent variables can be transmitted every 2nd, 4th, etc. basic period, with the longest period being 1024 ms.

The sporadic phase between two periodic phases allows devices to transmit data on demand. Sporadic transmission is associated with the transmission of events which are any state changes including communication. Therefore, events are acknowledged to ensure that no state change gets lost.

Process Variable Transmission

Transmission of variables is triggered by the master which broadcasts a request frame for a certain variable or a set of variables. In response, the device which sources the variable answers by broadcasting to all devices a frame containing the requested value. Each device interested in this variable picks up the value (figure 6).

The format of the frames is fixed at configuration time for all parties. Process Variables are stored in *ports*. A port is a memory region in a shared memory, the *Traffic Store* (TS), which application and bus access independently. On the MVB, each device can be subscribed (as source or as sink) to up to 4096 ports. On the WTB, a node can source only one port and sink up to 32. Thus, the Traffic Stores implement a *distributed database* refreshed by the bus.

The principle of source-addressed broadcast allows the independent operation of the applications and of the bus. The application processor is interrupted on reception or transmission only for time synchronization. Determinism is ensured from end to end by the periodic nature of the application processes and of the bus. Since Process Variables are transmitted periodically over the bus, there is no need for an explicit retransmission in case of occasional loss. To cope with persistent faults, the bus controller maintains for each variable a counter, which indicates how long ago the variable was refreshed. In addition, a check variable may be transmitted with each variable to certify its timely and correct production.

Message Transfer

Applications exchange messages transparently over the Train Communication Network. (An application does not see if its peer resides on the same bus, on the same station, or anywhere else on the TCN).

Application communicate on a Client/Server basis: a conversation consists of two messages, a Call sent by the Client and a Reply sent in response to it by the remote Server. Messages are divided into small packets for transmission. Each packet carries the full address, which identifies its source and destination. The train bus nodes route the packets, using a Function Directory that indicates which device is executing which function. A re-transmission protocol cares for flow control and error recovery. This transport protocol is

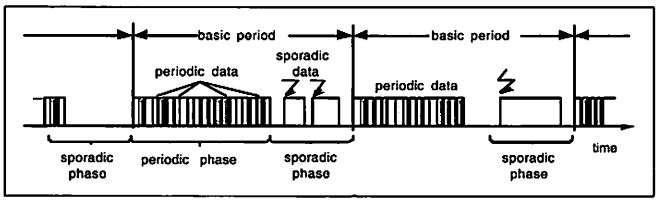

Figure 5 Periodic and sporadic data transmission

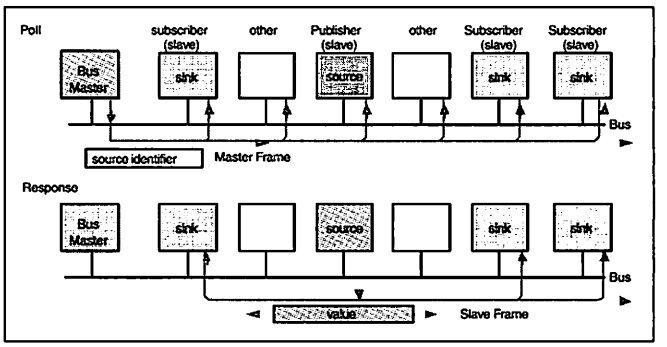

Figure 6 Process Variable transmission

executed by the end devices only; intermediate nodes only intervene in exceptional cases (inauguration, for instance).

The Real-Time Protocols and the ISO OSI Reference Model

The TCN has been specified in accordance to the ISO OSI 7-Layer reference model. MVB and WTB differ only in the layers 1 and 2 (physical layer and link layer). Because process data are neither routed, nor need a transport protocol or a session protocol, the application interfaces directly with the link layer. Messages, on the contrary, are routed from MVB to WTB and need flow control and application acknowledge involving all layers.

TCN Gateway

The TCN gateway connects one or more MVBs with the WTB. The marshalling of process data from MVB to WTB and vice versa is done by a special gateway application program, the so-called Process Data Marshalling (PDM). The way how process data are marshaled must be configured in dependency of a specific application. Routing of messages is done within the network layer of the Real-Time Protocols (RTP). The routing requires some information about the internal structure of the vehicle. Especially the mapping between logical function and physical MVB device is required which is preconfigured in the function directory table.

Train Network Management (TNM)

The Train Network Management helps in configuring, commissioning, and maintaining the TCN system. To this effect, a Network Manager may be connected to the TCN. The Manager has access to all devices connected to the TCN, in the same and in other vehicles.

The Manager can inspect and modify other devices through an Agent, which is an application task running in each device capable of being managed. The Agent has local access to the managed objects: process variables, protocols information, memory, tasks, clock, etc. Management Services are specified to read and write the managed objects, along with the format of the Manager Messages.

III.UIC Communication

TCN describes the basic communication mechanism for intra-vehicle (MVB) and inter-vehicle (WTB) communication. TCN does however not define an application specific

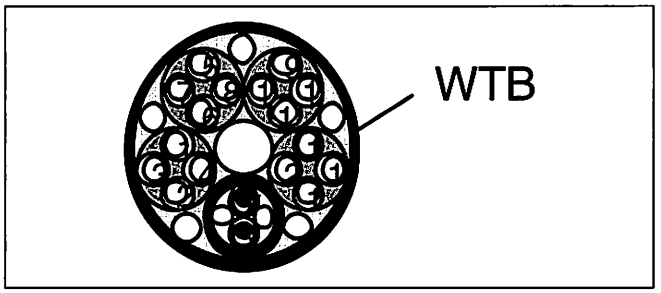

Figure 7 18-wire-UIC cable as defined in UIC558

profile like the content of process data frames and messages, their meaning, the time period of process data, special requirements concerning redundancy and so on. UIC (Union Internationale de Chemin de Fer) recognized that prescribing TCN for usage in freely composed passenger trains is not enough to ensure interoperability between vehicles from different manufacturers. This insight led to the definition of a profile for passenger trains.

The definitions for cabling are defined in UIC code 558. The inauguration, content of process data frames and communication related part of the profile (train messages) is defined in UIC code 556 [UIC556]. The application of the defined process and message data has been described in the accompanying UIC codes 557 (diagnosis), 647 (remote traction control), 560/660 (door control) and 54x (brake control). In this chapter, the basic communication concept as it is defined in the UIC code 556 shall be explained.

Architecture

The most obvious difference between TCN and UIC is the fact that UIC only defines train bus communication. Vehicle internal communication is beyond the scope; a vehicle is rather treated as a 'black box' that only provides a set of logical functions. In this sense, there is some similarity to the logical architecture of TCN. This is reasonable because vehicles are bought from different manufacturers and normally differ in the internal design and functionality. On train bus level, communication takes place between vehicles and not between nodes. There may be a 1:1 mapping between nodes and vehicles (if a vehicle incorporates exactly one node), but this must not be true if train-sets[4] or vehicles with more than one node are involved. Thus, since UIC decided to take the WTB for train bus, a mapping between UIC addressing scheme (vehicles and functions) and TCN addressing scheme (nodes and functions) is essential.

Data Telegram Types

In correlation to the TCN data model, the UIC distinguishes R(egular)-telegrams which are mapped to TCN process data and E(vent)-telegrams that are mapped to TCN messages.

Process data originating from all functions within one vehicle are collected in one R-telegram that is cyclically broadcasted on the WTB. The time interval between two emissions (individual period) is fixed to 100 ms, the maximum length of a R-telegram is limited to 1024 bits. Data structure and contents of the R-telegram depend on some dynamic and static vehicle properties. UIC 556 defines four telegram types:

R1 to be emitted by the leading vehicle[5] only
R2 to be emitted by traction vehicles only (if not leading)
R3 to be emitted by all other vehicles
void to be emitted if the UIC inauguration failed

Since the R-telegrams are broadcasted, each vehicle receives the R-telegram of all other vehicles. Besides data types and semantics, UIC defined some rules ('process data marshalling') that shall be applied for the correct interpretation of received R-telegrams. (Example: The R-telegram data 1.9 or 1.10 (status indication: all doors left/right closed) have to be ANDed over all received R-telegrams in order to achieve the final value of this data.)

E-telegrams, on the other hand, are sent point-to-point (single vehicle address) or point-to-multipoint (collective address, group address) between functions. All the E-telegrams are defined with respect to syntax and semantics and have a common 10 Byte-header.

Addressing

As mentioned, UIC addresses vehicles and functions within the vehicles. Vehicles are simply numbered from 1 to n. A set of rules unambiguously defines which end vehicle receives the address 1 (for instance, if the end vehicle is a leading vehicle then this vehicle gets address 1). The assignment of the *vehicle address* to the individual vehicles is done during the so-called UIC Inauguration (see below). Vehicles can be grouped, either pre-defined (*collective address*, e.g. 'leading vehicle', 'all vehicles with 1st class passenger seats', 'all sleeping cars') or user defined (*group address*).

UIC 556 further defines the function numbers to be used for traction, doors, light etc.

UIC Inauguration

As a result of TCN inauguration, the WTB nodes know their WTB address, their position and their orientation with respect to the TCN master. This information is not sufficient for UIC addressing because the mapping between WTB node address, the corresponding vehicle address, and the orientation with respect to the train's reference direction is not known. For UIC addressing, additional information is needed like for instance the number of vehicles that are controlled by a node or the position of the leading vehicle. Supplying more detailed information about the vehicle is the task of the UIC Inauguration. The UIC Inauguration makes use of the TCN-WTB feature to broadcast application information describing the vehicle ('vehicle descriptor') during the distribution of the TCN topography. This mechanism ensures a completion of the UIC Inauguration within typically less than 1 second. As a result, each WTB node has a consistent collection of all vehicle descriptors. These descriptors are used to build up the *NADI* (Node Address and attribute DIrectory) which finally contains a description of the whole train. Since the algorithms that are used are normalized, all nodes will possess an identical copy of the NADI. For inclusion of vehicles without a running gateway, or for adding information to the NADI, the NADI result may be corrected.

Implementation

UIC communication has to be supported by the gateway which includes a software module called *UIC Mapping Server* (UMS). This UIC Mapping Server mainly performs the UIC Inauguration and the NADI build-up. The module follows the design that is defined in the UIC code 556 annex 3. Besides the basic services mentioned above, the UMS also provides some services that allow control of WTB operation, definition of groups and reading respectively modifying the NADI. To make these services remotely available, an interface software module (UMSI) may be implemented as an application which can be installed on any programmable unit that is connected to the MVB. The UMSI provides a functional interface of the UMS services towards the application software.

[4]A UIC train-set may consist of up to 6 vehicles which are interconnected by for example one MVB and share one WTB gateway.

[5]The 'Leading Vehicle' is the vehicle within a train composition which has overall control of the train (typically the vehicle with the activated driver's cab).

IV. TCN Projects

From 1996 until 1999, the E.U.-project ROSIN (= Railway Open System Interconnection Network) successfully demonstrated the interoperability concerning inter-and intra-vehicle communication between several different manufacturers' equipment[6].

- ✦ demonstrating intra-vehicle interoperability for mass transit
- ✦ demonstrating inter-vehicle interoperability for passenger trains
- ✦ showing openness towards external systems (GSM-gateway for online diagnostic monitoring).

Further, it demonstrated solutions for exploiting TCN for freight trains and retrofitting coaches with existing, simple cabling.

The test suites for UIC conformance testing describe how interoperability for WTB nodes may be verified and are included in UIC code 556 as annex 8.

MVB interoperability is verified on TCN as well as on application level by the projects' system integrators.

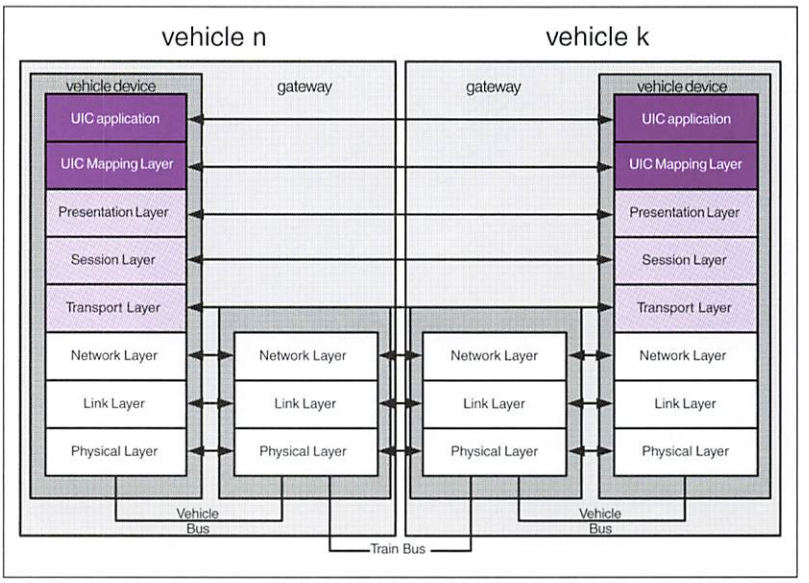

Figure 8 TCN/UIC stack for inter-vehicle communication (after inaugurations)

TCN Suppliers

The list of TCN equipment has considerably increased during the last years and is supplied for example by Adtranz, Alstom, Ansaldo, Deuta, Duagon, GE Harris, FAR Systems, Faiveley, Hagenuk, IFE, Knorr Bremse, Mannesmann Rexroth, Schneider Electric, Selectron Lyss, Secheron, Siemens, and Wabco.

Vehicle Projects

In the last few years, TCN has been successfully applied to an ever increasing number of vehicle projects. It is being used and proven for well over thousand locomotives for DB AG, FS, SBB, ÖBB, OSE, PKP, Russia, and Britain; the ICE3 high-speed trains for DB AG and NS; a few hundred EMUs and DMUs for Britain, Germany, Italy, Switzerland, Norway, Sweden, Denmark, Australia, Brazil, and Portugal; a few hundred trams for Switzerland, Germany, and Austria; the metros in Stockholm, Manila, Pusan, Iran, and Prague; and a few hundred coaches for SBB, ÖBB, and FS.

[6]The project consortium consisted of ABB, Adtranz, Alstom, Ansaldo, CAF, Firema, LAB, Siemens in cooperation with UIC and UITP.

As TCN usage is becoming wide-spread, the retrofit business is starting to become more important beyond the initial small projects. E.g. DB AG currently has a tender for retrofitting about 2000 coaches with WTB. The initial TCN "killer" applications which drive the usage of this technology are diagnosis to improve the availability of the rolling stock and remote traction control. In the second wave, innovative Passenger Information Systems and other passenger comfort applications gain more and more importance.

References

[TCN] TC 9/WG22; *IEC 61375-1*; TCN Standard; International Electrical Committee

[UIC] UIC 556 Steering Group; *UIC Code 556*; 2nd edition; May 1, 1999; Union International de Chemin de Fer, Paris

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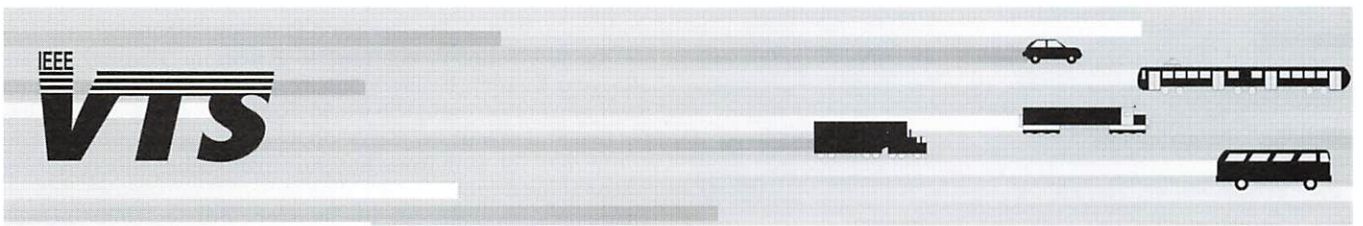


Aiding Humanitarian Relief Efforts and Restoring Telecommunications Networks in Times of Disaster

Dag Nielsen and Jennifer Hilborn, Ericsson

In April 2000 melting snow and heavy rains led to serious flooding in Hungary, Romania, and the Federal Republic of Yugoslavia. The area of Szolnok, Hungary was among the hardest hit with the city lying about 1-1.5 metres below water and enormous pressure on area dams. More than 2000 people were evacuated from 11 settlements and many others were advised to leave their homes. Roads were blocked by water and both terrestrial and mobile telecommunications systems were damaged.

Hungary is a recent example of how communities are overcome, lives are threatened and daily existence is severely disrupted when disaster strikes. During disasters,

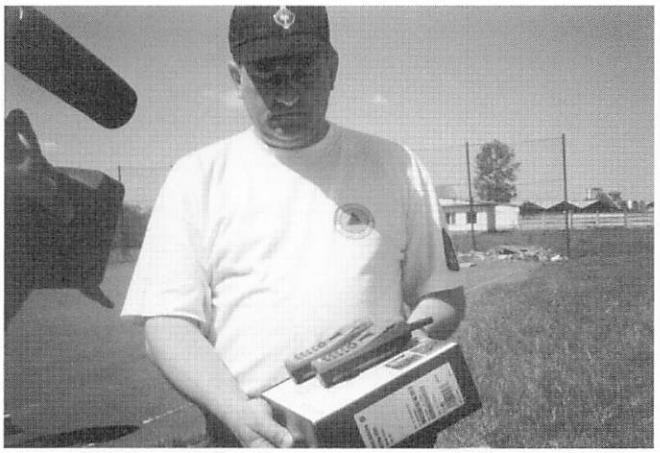


Figure 1 Ericsson R250 Pro GSM handsets are shown off to the media in Hungary

Figure 2 Oops!

Figure 3 Fortunately the handsets are ruggidized

terrestrial telecommunications networks are often disabled, contributing to the difficulty of co-ordinating disaster relief efforts. This is especially felt in areas that are physically isolated from emergency services. Having a mobile telecommunications system in place is often necessary to co-ordinate emergency responses while terrestrial systems are being restored.

The need for emergency telecommunications is growing. Disasters around the world are increasing in severity and scope. Fewer communities are able to cope with the economic, social and structural damage that results from natural and man-made disasters. The International Federation of Red Cross and Red Crescent Societies (IFRC) World Disasters Report (1999) states, "compared to the 1960s, the past decade has seen the number of great natural catastrophes triple, costing the world's economies nine times as much."

A number of factors have contributed to the growing human and economic costs of disasters including climate change, increasing concentrations of people in vulnerable areas and political and economic instability in certain parts of the world. The effects of disasters are more devastating in developing countries because they lack the preparation and resources that developed nations have access to. As disasters get worse and more frequent, the need to utilize emergency communications technology is ever more prevalent.

The World Disasters Report also identified the need for better preparedness in anticipation of the onset of disasters. "Natural catastrophes still provoke 'knee-jerk' responses from donors and agencies – aid is often reactive, media-driven, misdirected and too late. New solutions are needed. More money spent before disasters strike could save lives and funds in the aftermath."

Responses to disaster are generally led by local emergency services including fire, ambulance, police, and even the military. They rescue people in danger, tend to the injured, and move people to safety as best they can. There may be incredible acts of heroism. But the fact is major disasters overwhelm local responses quickly, leaving people vulnerable. At that point, any remaining civic authorities assess the situation. If they are able, they may call on others from surrounding towns and cities, provinces and states, or even international governments and organisations to help.

Responding to the United Nations' Call to Action

Recognising the need for a better response to disasters around the world, UN Secretary General Kofi Annan issued a call to action at the world's biggest telecom show in Geneva last year for telecommunications and high-technology companies. He implored them to provide mobile and satellite communication for humanitarian relief workers in areas affected by natural disasters and complex emergencies. The Ericsson Response program was a perfect fit.

Ericsson Response, in partnership with the UN and IFRC, is a global initiative with a mandate to develop a better, faster and more effective response to disasters. This includes harnessing and directing Ericsson's existing communications expertise and resources to help respond to human suffering due to disasters. It also means working to gain a better understanding of disasters and disaster response.

Disaster relief is not new to Ericsson. Throughout its 125-year history, Ericsson has responded to disasters in its local markets around the world. Employing its technical expertise and resources, Ericsson has provided personnel and equipment for numerous humanitarian relief efforts during natural and man-made disasters. Some examples of Ericsson's involvement in disasters during 1999 include providing equipment and technicians to establish communications during the flooding in Vietnam and Hungary; following the earthquakes in Turkey; and to support the human displacement due to war in Kosovo.

Ericsson employees often offer far more than telecommunications expertise. In Vietnam, more than 1,000 people were killed and 1,000,000 homes destroyed due to floods which also damaged main roads and hampered relief efforts. Local Ericsson employees contributed to relief efforts by distributing food, donating handsets, collecting clothing and raising money. All this was donated to Red Cross relief efforts.

During the flooding in Hungary, Ericsson and Hungarian telecommunications company, Westel, provided support for flood relief efforts by offering GSM telecommunications ser-

vices as well as Ericsson R250, GSM Pro telephone handsets. These handsets are water, dust and shock resistant, very appropriate for working in disaster environments. Ericsson provided GSM Pro handsets to the Hungarian Red Cross in order to help organise the flood control activities. Mobile telephone sets were also provided to the Hungarian Army, to the Knights of Malta and to the local governments of several towns and villages. In this case, telecommunications infrastructure was not destroyed. But the traditional means for communicating were not hardy enough to be used to coordinate efforts on the ground.

Although Ericsson does have some experience with contributing to disaster relief efforts, it does not intend to take on disasters single-handedly. Ericsson is committed to providing telecommunications expertise to relief efforts in partnership with leading humanitarian organisations that administer disaster response programs. These include the United Nations Development Program (UNDP), the Office for the Co-ordination of Humanitarian Affairs (OCHA), and the International Federation of Red Cross and Red Crescent Socieities (IFRC). These organisations have years of experience co-ordinating rescue and relief efforts; but do not normally benefit from the latest developments and innovations in telecommunications solutions as part of these relief efforts.

Preparedness is Critical

Mobile telecommunications can contribute to disaster relief in two ways; by helping humanitarian relief efforts once a disaster has struck and; before disasters strike, by ensuring that appropriate emergency telecommunications services are available and functioning.

There are a number of measures that can be taken to ensure disaster preparedness. The first step is to determine what level of preparedness is required to enable the community to deal with the onslaught of disasters. Ericsson Response is conducting Pilot Projects to enhance the level of disaster preparedness and response in select countries that are particularly prone to disasters. These projects will provide Ericsson Response program with a benchmark for developing a response that addresses the varying levels of preparedness of different countries. It will also give Ericsson Response important information on the effort involved in improving the preparedness levels of countries that need it.

Turkey, Vietnam, Thailand, Iran, Central America and Equador – countries that are more disaster-prone due to geographic location or economic situation – have been chosen for this pilot project. In each location, Ericsson Response team members are working with local experts from the UN and the IFRC, as well as Ericsson employees. This group will help determine the current preparedness level of these countries: what resources exist; what infrastructure is available; who can we work with in the event of a disaster to establish a disaster communication infrastructure and to restore permanent communications; what is needed to build common preparedness plans and communication response plans in the event of a disaster?

Mobile Telecommunications – Taking Action

The ultimate objective is to have Ericsson Response projects in every country – where needed and when possible – working with local disaster relief organizations to build preparedness programs in anticipation of disasters, ensuring rapid and effective deployment of communication solutions. In the case of countries that are either less prone to disasters, more affluent Ericsson local companies, can prepare to send relief to those who need it more.

In Vietnam, Ericsson Response met with members of the UNDP and IFRC who, over the years, have plotted out areas which are particularly prone to floods. On this map, Ericsson plotted out areas that currently have mobile networks against areas where there has been repeated flooding. In some cases, because of a lack of business justification, areas are not being served by existing mobile networks. Ericsson is working to close the gaps on the mobile grid so that at-risk areas will be covered when disasters strike. It is important to note that during re-occurring disasters in Vietnam, existing mobile networks are normally the only means of communication that are operational. The benefits of the Ericsson Response project for Vietnam will be that an improved mobile communication system will not only help in times of disaster, but will provide rural, currently disconnected areas in Vietnam with a communication link and an opportunity to participate in Vietnam's growing economy.

To help determine what mobile telecommunication requirements humanitarian relief organizations have when they respond to disasters, delegates from various humanitarian organisations that conduct disaster relief have met with Ericsson Response. Ericsson Response has organized a number of technical presentations in Stockholm for relief organizations. Through these workgroups, technology areas have been identified that would be useful in relief efforts. For example, the availability of temporary GSM / cellular networks that could potentially include Wireless Application Protocol (WAP) and Mobile Positioning System (MPS).

Relief organizations also have programs for the discussion of disaster response. The Working Group on Emergency Technology (WGET), convened by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), is an open forum to facilitate the use of telecommunications in the service of humanitarian assistance. It is comprised of United Nations entities, major NGOs, the ICRC, the ITU and experts from the private sector and academia. Members of the Ericsson Response team contribute to WGET in an effort to improve relief efforts world-wide.

There are a number of technical and operational areas to be addressed in the upcoming months that will help facilitate using telecommunications in disaster response efforts. This exchange of knowledge between relief organizations and technology experts at Ericsson Response will continue to influence and improve relief efforts.

Tampere Convention – Crossing Borders

The Tampere Convention was devised in 1998 in recognition of the essential role of telecommunications in coordinating humanitarian relief efforts. The major purpose of this convention is to facilitate the movement of people and equipment across borders during relief efforts. Regulations around frequency permits and licensing are aspects that require further definition within the Tampere convention in order to make disaster relief more efficient.

To date, only six of 47 member states have ratified the agreement. It must be ratified by 30 states in order for the Tampere Convention to enter into force.

Opportunities to Assist

There are many opportunities for Ericsson to respond to appeals for help in disasters. This response can be in the form of teams, individuals or equipment.

The first opportunity is, together with international relief organizations, to assess damages and propose international relief efforts needed to cope with the disaster.

Once humanitarian relief efforts have started, the second phase is to bring in and implement telecommunication services primarily to the relief organizations.

The third phase begins when relief efforts are well under way. There is an opportunity to complete a comprehensive assessment of damages to the telecommunications infra-

structure, provide technical information and expertise and help in the rebuilding process.

A Vision for the Future

Eventually, Ericsson Response hopes to have a broad presence in countries around the world where co-ordinators will be responsible for disaster response. Ideally, local coordinators will work with relief organizations in their area to establish a list of telecom experts and other volunteers in the country. In addition, co-ordinators will compile and manage an emergency stock of telecommunication equipment. They will be up to date on both the fixed and mobile telecom infrastructure in the country and maintain a relationship with the national telecommunications companies, operators and other authorities. Local or regional Ericsson Response teams will also devise and keep plans for a quick reconstruction of networks and for immediate increases in network capacity and frequency for radio, mobile, microwave and satellite networks.

There are a number of different ways that members of the telecommunications industry can contribute to disaster relief, in addition to those outlined above as part of Ericsson's commitment. Ericsson Response is beginning a process for customers and business partners to also get involved in the issue, in both local markets and internationally. Ericsson employees, through research and development, are investigating the application of technologies to support this important issue and are testing new technologies that would be able to withstand the effects of a natural disaster, as a means of helping communities around the world be better prepared. The future will bring new developments in mobile communications that can be used with disaster relief in mind – and help to lessen the devastating effects of disasters for communities around the world.

About Ericsson

Ericsson is a leading communications supplier, providing total solutions covering everything from systems and applications to mobile phones and other communications tools. With more than 100,000 employees in 140 countries, Ericsson supplies communications for customers all over the world.

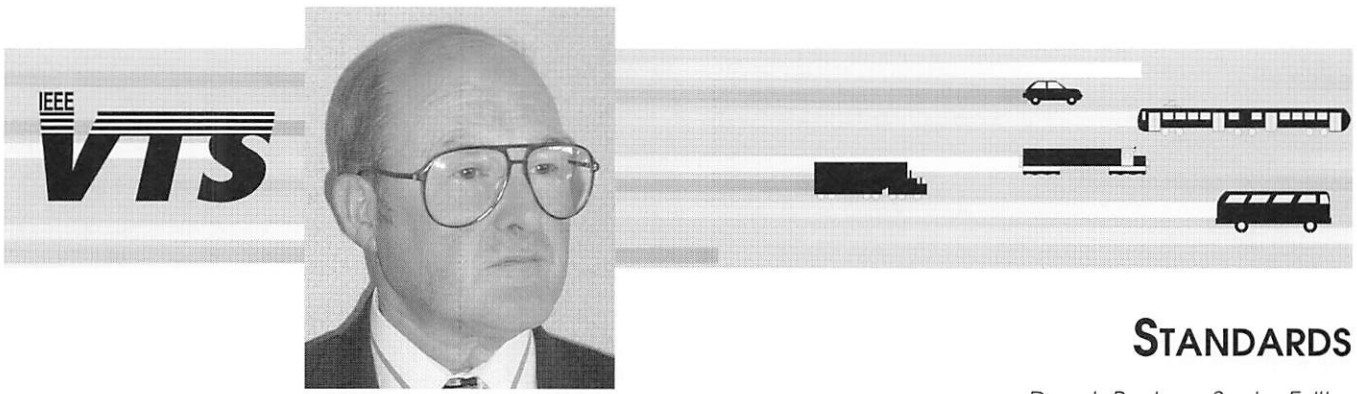
About the Authors

Dag Nielsen, Improvement Leader, GSM Systems, Division Mobile Systems, Ericsson

Seconded from within Ericsson's GSM division because of his extensive operational skills and years of work with the IFRC and the UN, Dag Nielsen has been with the Ericsson Response team since August 1999. Dag's work helps bring the concept and good intentions of Ericsson Response to an on-the-ground reality.

Jennifer Hilborn, Manager, Social Marketing Brand Experience Management, Ericsson

Jennifer Hilborn joined Ericsson Corporate in January 1998. As manager of corporate citizenship, Ms. Hilborn focuses on the development of global strategies and programs in corporate citizenship/social marketing for Ericsson.



STANDARDS

Dennis Bodson, Senior Editor

What's New in Standards!

Dear VTS Members,

I would like to take this opportunity to introduce myself. My name is Dennis Bodson, and I am the Chairman of the VTS Standards Committee. It is my intent to provide you with information on a periodic basis about what the Vehicular Technology Society (VTS) is doing in the world of standards. I thought I would start off with my biographical sketch to acquaint you with my background and experience in the standards arena. Subsequent columns will address VTS standards activities.

I look forward to presenting you with the most current standardization activities of the VTS.

Sincerely,

Dennis Bodson, Chairman
VTS Standards Committee.

Born in Washington, DC, on July 7, 1939. Received the B.E.E. and M.E.E. degrees in Electrical Engineering from The Catholic University of America, Washington, DC, in 1961 and 1963, respectively, and a Master's degree in Public Administration from the University of Southern California Washington Center for Public Affairs, Washington, DC, in 1976. Completed his PhD in Electrical Engineering, from California Western University, in 1985.

During 1963-1966, served as an officer in the U.S. Air Force at the National Security Agency. From 1966 to 1969, he was with Vitro Laboratories, Atlantic Research Corporation and the U.S. Army Materiel Command, where he was engaged in Research and Development, and Systems Engineering. In 1970 joined the staff of the National Communications System (NCS), an organization of the Federal Government, in Washington, DC. Prime areas of responsibility are telecommunications technology, electromagnetic pulse, and the development of International, National, and Federal Standards relating to National Security and Emergency Preparedness Communications in the areas of, network management, restoration of networks, network congestion control, protection of networks, optical switches,

broadband integrated services digital network (B-ISDN), asynchronous transfer mode (ATM), synchronous optical network (SONET) digital hierarchy, video-teleconferencing, facsimile, high frequency (HF) radio systems, cellular systems, mobile systems, personal communication systems (PCS), universal personal communications (UP) systems, security of communications, and building communications wiring, including optical fibers. Recently retired from Federal service as the Chief of the Technology and Standards Division of the National Communications System.

Registered Professional Engineer in the District of Columbia and State of Virginia, is certified by the National Council of Engineering Examiners, holds an FCC First Class Radiotelephone with Radar endorsement and a Radiotelegraph License, is an Amateur Radio Extra Class Licensee (W4PWF), and is a Fellow of the IEEE and a Fellow of the Radio Club of America. Currently the Director of the Roanoke Division of the Amateur Radio Relay League.

TRANSPORTATION SYSTEMS

Harvey Glickenstein, Senior Editor

Four European railways have formed a joint company to create a new high-speed rail network. The new company, to be known as Rhealys, will provide service at speeds approaching 200 mph between the networks of the French National Railways (SNCF), Luxembourg Railways (CFL), German Railway (DB), and Swiss Federal Railways (SBB). It will be headquartered in Luxembourg.

Rhealys will work with the supply industry to develop interoperable trainsets, similar to what has been done with the Thalys service operated over tracks of the railways in the Netherlands, France, Belgium, and Germany. Rhealys trains are expected to start operating after the first section of the TGV Est network in France is opened in 2006.

The Delhi Metro Rail Corporation (DMRC) is about to award its first contract for rolling stock. At the time the tenders were advertised there had been no decision as to what track gauge to use. The most common track gauge in India is broad gauge—five foot four inches between the running rails. Most of the track in the Western hemisphere and in Western Europe is standard gauge—four foot eight and one-half inches. In addition to the broad gauge in India, both narrow gauge—three and one- half feet—and meter gauge are used. India is in the process of converting its railroads to broad gauge in order to have a uniform gauge throughout India.

The consultants to the DMRC and the staff of DMRC proposed that since the rail lines being built for the Delhi Metro Corridor and the Delhi Rail Corridor would not use the same equipment as on the Indian Railroads, they would use standard gauge track. This would make it easier to purchase rolling stock, as off-the-shelf equipment would be available from European and Japanese suppliers. The Government Council of Ministers disagreed, however, and the final decision was made in August to build the system at broad gauge.

Tenders from both Alstom and Siemens for the signaling are also under review.

The first section of the Rail Corridor, from Shahdara to Tis Hazari, is scheduled to go into service in March 2002. Construction on this section, which includes the new bridge over the Yamuna River, started on October 1, 1998. The next section, from Tis Hazari to Trinagar, is scheduled to go into service in June 2003. The balance of the 15.5-mile Rail Corridor is scheduled to be in service in March 2005. This corridor will have both elevated and at-grade sections and will use overhead catenary energized at 25 kV 50 Hz.

The 6.8-mile long Metro Corridor, which will be entirely underground, crosses the Rail Corridor at the Interstate Bus Terminal (ISBT) Station. At that location the Rail Corridor will be on an elevated structure. The Metro Corridor will operate between Delhi University on the north and Central Secretariat on the south. Unlike the Rail Corridor, the Metro Corridor will use rigid overhead catenary energized at 750 volts. The Metro Corridor is scheduled to be opened for revenue service in two stages—the first by June 2004 and the rest by March 2005.

There are plans to expand both corridors in the future, but funding for the extensions is not yet in place.

Denver opened its Southwest Light Rail Line in July. This line is an 8.7-mile extension of the existing Central Light Rail Line. It adds five new stations to the system. Denver purchased 14 new light rail cars to service the new line and increased patronage on the existing line.

Pittsburgh's Port Authority has awarded a contract for 28 new light rail vehicles and rehabilitation of its 55 existing light rail vehicle. The contract was awarded to Construcciones Y Auxiliar De Ferrocarriles, S.A. and its U.S. subsidiary, CAF USA, Inc. The contract includes an option for 15 more cars.

The rehabilitation work includes converting the existing fleet from dc motors to ac motors. This conversion will improve the efficiency of the propulsion equipment and reduce maintenance costs by eliminating the commutators required with dc motors. The overhead line voltage will remain at 600 volts dc, with a new variable voltage, variable frequency drive allowing a smaller ac motor to operate with similar torque-speed characteristics to a dc traction motor. The propulsion package will be supplied by Adtranz, which was recently sold by DaimlerChrysler to Bombardier.

The contract calls for all the new vehicles to be in service when the rebuilt Overbrook Line returns to service in 2003.

In other news, the Port Authority selected its locally preferred alternative for extending the light rail line from downtown to the North Shore.

The existing light rail service serves the area south of Pittsburgh. The new North Shore Connector would operate from the existing Gateway station under Stanwix Street and the Allegheny River. North of the river it would emerge from the subway and operate at grade to a location west of the new Steelers Stadium. It would then operate on an elevated alignment to a proposed Intermodal Transportation Center near the Carnegie Science Center before descending back to an at grade alignment, terminating near the West End Bridge.

Bangkok Skytrain unit approaches Phrom Phong station above the congested traffic.

The locally preferred alternative also includes a line connecting the Steel Plaza Station with a new station to serve the Convention Center, Liberty Center, Greyhound Terminal and Amtrak station.

The chosen alignment was the survivor of more than 60 alignments that were studied over a three-year period. The next step is to hire a consultant to prepare the Final Environmental Impact Statement and Preliminary Engineering.

Bangkok's Skytrain system had lower than expected ridership in its first six months. In order to increase the ridership, the Bangkok Transit System Corporation has instituted a number of marketing initiatives. These include discounted monthly passes, discounts and giveaways from merchants located near the stations, and a complimentary shuttle bus for passenger living within three miles of Skytrain terminals.

The $13-Billion system was built under a build operate transfer contract where ownership of the system would be turned over to the government after eight years. It has two intersecting lines with a total length of 4.6 miles for the entire system. Although the distance-based fares seem low by U.S. standards, they are substantially higher than the ten cents charged by the competing bus service.

Guangzhou China has ordered additional rapid transit trains. Adtranz, the subsidiary of DaimlerChrysler that was recently sold to Bombardier Transportation, was awarded a $186 million contract for 26 six-car trains. They will be produced by CARC, a joint venture of Adtranz and the Chinese government-owned Changchun Car Company. These trains will be used on Line 2, which is scheduled to open in stages between January 2003 and the middle of 2004. The first two trains will be manufactured in Germany and are planned for delivery in 2002. The balance of the trains will be manufactured in China.

The new cars will use a 1500 Vdc IGBT inverter drive.

The existing Line 1 operated by the Guangzhou Metro Corporation uses 126 cars that were manufactured by a Siemens/Adtranz consortium.

DART in Dallas has won a referendum to accelerate construction of an additional extension to the existing 20-mile light rail starter system and the 4-mile extension under construction. The $2.9 billion dollar referendum passed by a margin of three to one. The money provided under this referendum will go towards an additional 50 miles of track, including a line to the Dallas/Ft. Worth International Airport. Passage of the referendum will allow the new extension to be built without increasing the existing one percent sales tax, which is dedicated to DART.

San Francisco's Municipal Railroad (MUNI) is proposing to reestablish rail service along 3rd Street. The 3rd Street Light Rail Project is a two-phase project.

Phase 1 would extend the Muni Metro light rail service south from the current end of the line at the Caltrain Terminal at Fourth and King Streets. The new line would cross the Fourth Street Bridge and run along Third Street and Bayshore Boulevard, ending at the Bayshore Caltrain Station in Visitacion Valley. Tracks would be constructed primarily in the center of the street to improve safety and reliability. The line would have only 19 stops. This phase of the light rail project is expected to open for service in 2004.

Phase 2 would extend light rail service north from King Street along Third Street, entering a new Central Subway near Bryant Street, crossing beneath Market Street and running under Geary and Stockton Streets to Stockton and Clay Streets. Underground subway stations would be located at Moscone Center, Market Street, Union Square and Clay Street in Chinatown. Muni and the City of San Francisco are actively pursuing funding for the Central Subway.

A new Metro East Operating and Maintenance Facility will be built on approximately 13-17 acres at 25th and Illinois Streets to store, maintain and dispatch light rail vehicles.

Korea has selected a consortium for a design-build-operate-maintain (DBOM) contract for a rapid transit system linking the suburban city of Kimhae with Pusan. The 15-mile line will have 18 stations and will use 46 vehicles. It will be fully automated, using similar technology to that used on Toronto's Scarborough Line, Vancouver's SkyTrain, Detroit's people mover, and Kuala Lumpur's people mover. The same technology will also be used on the system now under construction in New York City to link JFK Airport to Jamaica train station and Howard Beach station on the subway's Rockaway Line. Like JFK, Kimhae is the site of an international airport.

The $1.1 billion project is South Korea's first DBOM-type project. It is scheduled to go into service in 2004. The consortium, which is led by Bombardier Transportation and the Korean business group known as Kumhu Industrial Co. Ltd., will establish a jointly owned company to operate and maintain the system for 30 years.

Adtranz Signal has been awarded the Thameslink Associated Signalling Works Design and Development Contract for Railtrack Thameslink 2000. The project, which will use Adtranz Ebilock interlocking logic and the Adtranz Ebicos Traffic Management System, will control the London Bridge area and the inner core area of Thameslink 2000. It is scheduled for completion in April 2001.

AUTOMOTIVE ELECTRONICS

Bill Fleming, Senior Editor

U.S. Intelligent Vehicle Initiative Goals

At a SAE (Society of Automotive Engineers) Meeting on IVI (Intelligent Vehicle Initiative†) held on July 19, 2000, U.S. Transportation Secretary Rodney Slater urged in his keynote speech that the automotive industry agree to work with DOT (Dept. of Transportation) on the newly announced IVI objective of reducing crash fatalities by 20 percent over the next 10 years, which includes the following goals [1,2]:

1. Equip 10 percent of new light vehicles (cars, vans, SUVs, and pickup trucks) sold by 2010 with one or more IVI systems†.
2. Equip 25 percent of commercial vehicles sold by 2010 with one or more IVI systems†.
3. Deploy the infrastructure portion of a cooperative intersection collision warning system in 25 metropolitan areas by 2010.

Bob Lange, Safety Engineering Director, General Motors said, "it is possible to reach Slater's goal [1]." *Editor's note.* Bob Lange's positive support for DOT's goals is encouraging. But, then again, his support should be expected since IVI systems all involve electronics, which is among the highest profit items in automobiles today.

Renault To Make 1st Production 42-Volt System

Renault SA expects to become the first volume carmaker to switch from a 14-volt to a 42-volt electrical system, slated to first appear as a combined 14/42-volt system in 2004 models, and to later appear as a single 42-volt system in 2007 models [4]. The added 42-volt electrical capacity is needed to power new systems such as: electric braking, electric power steering, camless electric engine valves, etc.

Editor's note. Traditional hydraulically powered systems – brakes, steering, engine valves, etc. – are now in the process of conversion from hydraulic to electrical power for the following reasons [5]:

1. to eliminate parasitic pump losses – for greater fuel efficiency
2. to facilitate modular assembly – because electrical-input wire-harness-connected modules are easier to assembly
3. to facilitate multiplex electrical networking – because electrical systems can be directly interfaced with electrical multiplex networks; i.e., add-on hydraulic-to-electrical transducers are not required
4. to facilitate new opportunities for system function enhancements – because special-feature functions are easier to implement using direct-electrical-input actuators

Keyless, RF Transponder-Less, Fingerprint Car Start

Authorized drivers may soon use their fingerprint, not a key or an rf-transponder, to start their car. Fingerprint car startup should become available from Siemens and DaimlerChrysler within two years, and it's anticipated to be a production feature on 2003 Mercedes S-Class vehicles [6,7]. Fingerprints are sensed in a 160 mm^2-area – i.e., a 13-mm (0.5-in) square surface – using a 65,000-element capacitive-array, micromachined, silicon chip [7].

Fingerprint car startup is also said to be faster than startups using conventional key/ignition locks. And since the driver's personal identity is determined via the fingerprint, items such as mirrors, climate control, radio settings, steering column and seating positions; are automatically reset to match his/hers preferences (because the system knows from the fingerprint who is driving the car). *Editor's note.* Reference [8] additionally describes how driver fingerprints can also include his/hers size and weight information for best match to the output of an advanced air bag system.

Telematics (E-Mail, Internet, etc.) Controls in the Rearview Mirror

Gentex Corporation currently supplies General Motors with automatic-dimming rearview mirrors that contain an integral pushbutton/microphone interface with GM's OnStar system [9]. Gentex states that, "locating OnStar controls on the rearview mirror is just the beginning of utilizing the mirror's potential. In the near future, drivers (*hopefully in non-moving / parked vehicles*) will be able to access the Internet with a wireless modem in the mirror." Within the next 10 years, Gentex predicts that:

1. The GPS antenna will be integrated into the mirror
2. DVD movie rentals will be downloadable while you're refueling at your local gas/convenience store
3. Home activation of lights, gates, doors, security systems, etc. will be made available
4. Reception of traffic information via multiplexed broadcasts will be available
5. Paging, fax, voice mail (from both phone and Internet) will be available
6. Dictation/transfer of e-mail will be available

†IVI is a cooperative effort in the USA between the motor vehicle industry and government agencies that emphasizes collision avoidance technology. The IVI program was initiated in 1998 after it was previously concluded that the infrastructure for the nationwide implementation of automated highways was prohibitively expensive [3]. IVI systems on the road today, in production or prototype status, include: rear-end radar collision-warning, radar adaptive cruise control, machine-vision lane departure warning, infrared night-vision enhancement, and GPS/cell-phone automated collision notification.

7. And, yes, commercials aimed at vehicles in specific areas will also become commonplace

Editor's note. The specific-area-focusing of commercials that Gentex envisions could also be thought of as an invasion of privacy – is this a necessary evil associated with the introduction of telematics enhancements?

Cell Phone Distraction Issues

Gentex's future vision for mirror-mounted telematics features sounds great, but Gentex doesn't say anything about safety issues associated with increased distractions inside the vehicle. An interesting journal article called, "Death By Distraction," was recently published [10]. The article raised some new points that are worth passing on to our VTS readers:

1. "Research suggests that hands-free phones offer no safety advantage over hand-held phones, because like many other in-car devices, they facilitate/create mental distractions that in turn cause accidents" – p.32 of [10]. To be sure, Paul Green of UMTRI (Univ. Michigan) emphasizes that, "hands-free phones don't make a lot of difference from a safety aspect because the dialing process lasts only a few seconds. Less than 25% of cell phone-related accidents occur when dialing, over 50% occur when incoming calls force drivers to take their mind off the road unexpectedly – p.33 of [10].
2. The global laws that currently govern use of hand-held cell phones while driving are summarized in the following Table. Note that the USA and Canada are two of only three industrialized countries that have not yet proposed or enacted legislation to ban the use of hand-held cell phones while driving. (See Table 1)
3. A possible solution to the distraction problem is something that Paul Green of UMTRI calls the "driver's advocate." Many vehicles, especially luxury vehicles (i.e., the very vehicles that are most loaded with distractions) already have wheel-speed sensors, yaw angular-rate sensors, steering-wheel angle sensors, etc. – which can indicate the driving situation (i.e., the driver's work load). When driving, if the work load is high, incoming phone messages would not be forwarded to the driver, and would instead be returned with a recorded message that the driver is busy (but voice mail would be intact to receive/record messages) – pp.37-39 of [10].

Cell Phones and Brain Cancer

Can cell phones cause brain cancer? This could be another factor that might make drivers think again about their extended use. But is this a real problem? The short answer is, "epidemiological studies have not found evidence that cell phone use increases the risk of brain cancer, although there remains some ambiguity on how to interpret an apparent increase in one kind of brain cancer [11]."

Something to think about is the fact that the output of most modern handsets is adaptively determined by the base station. Consequently, a user's exposure to RF energy from a phone in a region of strong base-station signal might easily be lower than that from a phone in a weak signal area. Thus, mobile phone users with health concerns may wish to employ the following simple precautions [11]:

1. Avoid using cell phones in areas where the signal is poor – a weak signal causes modern handsets to increase their broadcast power.
2. Decrease phone usage (i.e., decrease your exposure)
3. Use an external headset/earpiece that keeps the cell phone away from your head

On the other hand, as *Scientific American* puts it, "researchers have only proven one certain danger from cell phones: they lead to higher rates of traffic accidents when drivers use them while driving. Potential health hazards from cell-phone radiation appear to be meager as compared with the dangers of, say, cigarette smoking [12]."

And finally, there is a cartoon [13], that shows a man talking on his cell phone, while driving, and he's saying, "I hope this cell phone isn't emitting dangerous radiation (I might get hurt)." At the same time, the driver is unaware that he's just run over a little old lady at a cross walk, and further up the street, he also ran over a boy on a bicycle. An appropriate caption for the cartoon, and possibly for this entire issue, might be, "*me first* attitudes – the real cause of driver distraction."

Year 2000 – Biggest Engine Trends

Six new engine design trends for this year were selected [14]. For those of you who are engine buffs among the readers, I'll list the non-electrical trends seen in the MY2000 engines, which are as follows:

1. Aluminum engine blocks
2. Timing chains, replacing cogged-rubber-cam timing belts
3. Cross-corporate engine sales (e.g., GM's purchase of Honda engines, and Mercedes purchase of VW engines)
4. Catalytically-coated radiators

Two automotive electronics-based engine trends for MY2000 engines were [14]:

Use of Hand-Held Cell Phones While Driving				
Currently Banned	**In Process of Banning**	**Legislation Pending to Ban Use**	**Study Underway to Support Possible Legislation**	**Phone Use Discouraged by Existing Legislation**
Australia Austria Brazil Israel Italy Japan Norway Portugal Singapore Spain Taiwan	Belgium	Chili Germany[1] Netherlands[1]	Canada Finland USA	Britain[2] France Sweden Switzerland[3]

[1] Would allow hands-free phones only

[2] Existing laws requiring 'due care and attention' are used against phone use while driving. Specific legislation banning use is also proposed.

[3] Reduced insurance coverage if accident is caused by driver using phone

Table 1 Global Laws Governing Cell Phone Use In Vehicles – from p.33 of (10)

5. Variable engine-valve timing, currently actuated by electrohydraulically means (scheduled to be actuated by electromechanical means within two years [15])
6. Cylinder deactivation, also called variable engine displacement, which is actuated by electrohydraulic or electromechanical engine-valve-disabling means [14].

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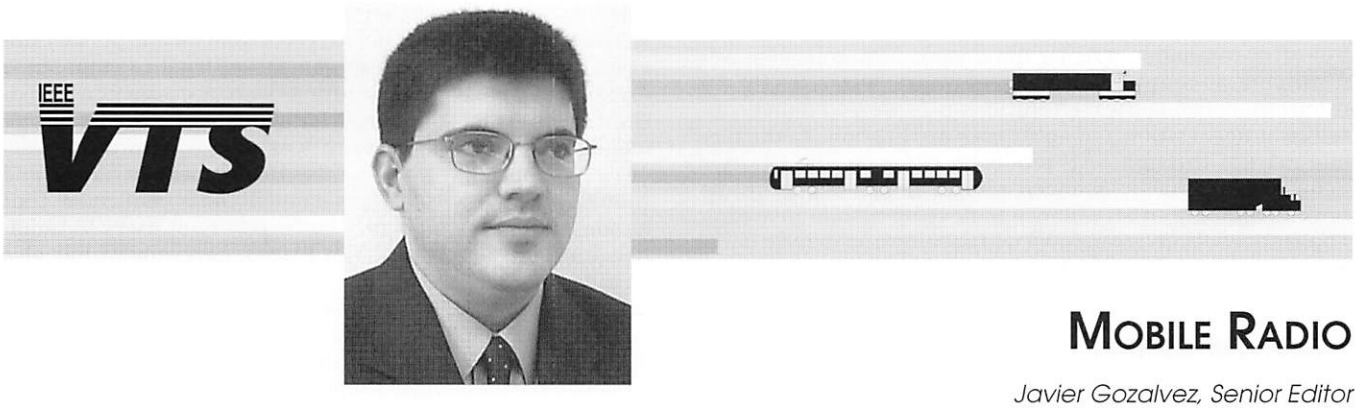


MOBILE RADIO

Javier Gozalvez, Senior Editor

Bluetooth news

Bluetooth (named after King Harald II of Denmark, who apparently had one bad tooth), received an important boost in France after the French National Agency of Radio Frequencies lifted a ban on the use of the 2.4GHz band.

The European Telecommunications Standards Institute (ETSI) organized last August the Bluetooth UnPlugFest forum. The event, that attracted more than 300 engineers from 60 companies worldwide (representing a 50% increase on last year), is a forum to allow companies to test the interoperability of their upcoming Bluetooth products.

Different market studies have been lately predicting a very bright future for Bluetooth technology. According to a study by UK-based analysts Frost & Sullivan, Bluetooth will take off from 2001 with European revenues for the Wireless LAN and Bluetooth market reaching $53.12 billion in 2006. Another study by Cahners-Instat Group estimates that sales of Bluetooth chips will top $1 billion next year. The study also predicted that between 150 and 200 million devices using Bluetooth will be used worldwide. A report by Allied Business Intelligence expects 1.4 billion Bluetooth-enabled devices to be used by 2005.

Infineon Technologies introduced its first Bluetooth system solution, named BlueMoon I chipset, for implementation of wireless device connectivity. The system includes an integrated baseband, link manager, a host controller interface chip and a separate RF transceiver. Silicon Wave Inc. introduced its Odyssey line of hardware and software products designed for Bluetooth systems. The company claims its SiW1501 Radio Modem is the industry's first single-chip radio designed specifically for Bluetooth applications. The Odyssey line also includes development and evaluation tools. NewLogic succeeded in implementing a Bluetooth baseband processor in 30k equivalent gates. The product, named BOOST Core, is the first of three Bluetooth products from NewLogic. It is supplemented by a user-friendly SDL based software protocol stack.

Researchers at Bell Laboratories have discovered some problems with the Bluetooth technology that would allow eavesdroppers to listen to digital conversations or determine a user's identity. One of the flaws was found in the protocol used by the devices.

Intel dismissed Bluetooth as a wireless LAN technology as it would cause interoperability problems with the 802.11 protocol. According to Don MacDonald, marketing director for Intel's mobile platform group, Bluetooth will not be able to make a significant impact in the corporate market.

Microsoft expands into the wireless market

Microsoft has announced over the past months a series of deals with wireless companies. Firstly, it announced a deal with Samsung to design and develop smart mobile phones using Microsoft Mobile Explorer wireless communications and Microsoft smart phone platforms. The phones, expected to be available in the second half of this year, will operate in both GSM and CDMA networks. AT&T, BT, Telefonica and T-Mobil are actually trialling Microsoft Outlook technology to offer email access through mobile phones. Outlook is available on SIM cards via Compact-HTML and WAP

browsers. Vodafone also join lately this group of operators as it announced an alliance with Microsoft to develop corporate mobile Intranet services. The deal includes technologies such as Outlook, Exchange, SQL server and Windows 2000. Microsoft also launched its first mobility solutions centre in Stockholm. The company also plans to open soon another centre in the US and probably two more in Asia. Concerning handheld devices, Microsoft rolled out Windows CE 3.0, the new version of its operating system for these terminals. Also, new tools to write programs for Windows CE are being launched.

m-commerce

According to a market report from IDC's wireless and mobile communications analyst, m-commerce in Western Europe is expected to rise $37.7 billion in 2004 from $51.2 million this year. IDC emphasised the need to focus on services and states that "m-commerce and mobile location-based services are the killer applications of the mobile Internet". MasterCard and Motorola announced they will cooperate in the development of m-commerce. The agreement includes research and development projects to assure interoperability between MasterCard's electronic payment systems and Motorola's wireless Internet devices and platforms. Also, joint marketing activities promoting the benefits of m-commerce will be developed. Motorola also announced a cooperation agreement with SAP, an inter-enterprise software solutions provider, to deliver intelligent notification and enterprise applications to the mobile market through SAP products. Ericsson and Charles Schwab & Co Inc, a financial service provider and online broker, announced an alliance to develop mobile investing applications. Both companies will develop and deliver wireless trading applications based on WAP. Ericsson also announced another alliance with the iAnywhere Solutions Inc subsidiary of Sybase to develop mobile banking solutions. Sybase would also establish a test centre for these products in Sweden. Sonera announced an agreement with Unilever and Hewlett-Packard to test new mobile marketing solutions in Finland. Senada.com Inc launched an m-commerce platform, based on WAP technology, designed to allow professional event planners to sell tickets on wireless devices.

Forums

The Mobile Wireless Internet Forum (MWIF) has joined the 3rd Generation Partnership Project 2 (3GPP2) as a market representation partner. The MWIF forum will provide to the project its expertise in the field of Internet protocol networks. The 3GPP2 was created in January 1999. Apart from the MWIF forum, 3GPP2 comprises the Telecommunications Industry Association (US), the Association of Radio Industries and Businesses (Japan), the China Wireless Telecommunications Standards Group (China), the Telecommunications Technology Association (Republic of Korea), the Telecommunication Technology Committee (Japan) and the CDMA Development group. Matsushita joined the SyncML initiative as its ninth sponsor. The initiative was formed to develop and promote an open industry specification to enable the creation of a new generation of interoperable wireless and wireline data synchronisation products. Six communications and semiconductor companies (ADC, Conexant Systems, Gigabit Wireless, Intel, Nortel Networks and Vyyo) have formed the wireless DSL consortium to accelerate the deployment of broadband wireless access solutions. The goal of the consortium is to provide standardised, timely, multivendor solutions for broadband wireless access. The consortium aims at developing a set of open interfaces for broadband wireless access products operating in the multichannel multipoint distribution service (MMDS) and the 3.5 GHz bands. The GSM association global roaming forum created a new working group looking at roaming between GSM and iDEN networks. TETRA operators have also shown interest in the forum, which was developed to facilitate Inter-standard roaming. With the same objectives as the forum, BT and AT&T launched a service that will allow for the first time roaming between GSM networks and TDMA networks.

Mobile phone health risks

Mobile phone manufacturers (Motorola, Nokia and Ericsson) have agreed to label mobile phones with radiation information. The information will not be available until next year as the manufacturers are actually working on developing a standard for measuring Specific Absorption Rates (SAR). SAR measures the maximum quantity of radiation absorbed by a kilogram of tissue from a mobile phone. The Cellular Telecommunications Industry Association has already approved a new policy requiring all mobile phones seeking CTIA certification after the first of August to include radiation information. Japan's MPT already established last May a working group looking at methods for measurement of SAR. The report is due to be finished by November 2000. The move comes after increasing concerns from consumers and organisations about the health risks from mobile phone radiation. The World Health Organisation tried to calm these fears saying no special precautions were necessary on the basis of scientific information so far available. One of its recommendations to limit exposure was to use "hands-free" devices. A study developed by the Department of Trade and Industry of the British government also confirmed that hands-free kits significantly cut exposure of users to radiation from mobile phones. The British government has also written to all schools setting out the potential health risks for children using cellular phones. The leaflet advises the restriction of the mobile phone usage for children under the age of 16. The government is also in talks with mobile phone companies to try to convince them to include the leaflet with the bills. This initiative is based on the conclusions reported by the Stewart report published last May.

China pushes forward TD-SCDMA standard

China decided to step up research on the TD-SCDMA standard according to Mr Zhou, Senior Telecommunications official from the Chinese Ministry of Information Industry. The technology developed by the China Academy of Telecommunication Technology (CATT) and Siemens is an important threat to the establishment of WCDMA and cdma2000 in China. China Mobile and China Unicom have already signed documents "endorsing" TD-SCDMA, according to Chinese officials; even though the companies have previously shown interest in WCDMA and cdma2000 respectively. Siemens has already announced that a significant portion of its investment in China will be spent on the joint development and manufacturing of TD-SCDMA equipment in China. Siemens and the CATT expect to commercialise the technology in mid-2001. Moreover, Siemens said that the company did not plan to sell UMTS equipment in China (other than through its joint venture with NEC, Mobisphere), demonstrating a big confidence in the development of the technology.

However, at the time of writing this column (early September), China Unicom is raising expectations that it could adopt, in the near future, CDMA technology. It is still uncertain whether the company will wait for next generation technology or adopt narrowband CDMA. Mr Wu, Minister of Information Industry, also renewed recently China's commitment to narrowband CDMA.

i-mode development

i-mode's success continues, despite the series of service failures, as NTT DoCoMo announced in August that its service has already reached 10 million users 17 months ahead of schedule. DoCoMo also said it expected the number of subscribers to rise to 17 million by the end of this year. Moreover, DoCoMo is continuing the development of its service through a series of deals with other companies. Sony and DoCoMo revealed plans to develop services linking i-mode to Sony's PlayStation game console. The two companies have agreed to launch entertainment sites on a broadband network accessible from both terminals. Other services, such as music and films, should come later. The alliance would also aim to connect the PlayStation to the coming WCDMA system. The Walt Disney Internet Group also revealed joint plans with DoCoMo to offer content services on i-mode (e.g., character screen savers and songs). Compaq is also entering, in a consortium with Japanese software house DreamArts, the i-mode market by developing business-oriented systems for i-mode. Moreover, DoCoMo claimed that its IMT-2000 services would be "multifunctional i-mode" mobile services, showing its strong commitment to the technology.

DoCoMo also unveiled a joint company with five other firms to offer comprehensive positioning and navigation information services. The company, to be called Location Agent Inc, will use GPS and personal handy phone technology.

GSM standardization work transferred to 3GPP

The 3GPP (3rd Generation Partnership Project) partners have agreed to extend the scope of the project to include ongoing standardization work on GSM (previously dealt within ETSI). A new Technical Specification Group (TSG), named GERAN (GSM/EDGE Radio Access Network), has been created to accommodate the work. Its responsibilities will be the maintenance and development of GSM Technical Specifications, including GSM evolved radio access technologies, such as GPRS and EDGE. Other tasks transferred include radio-specific operational and maintenance requirements and mobile station testing. Work on smart cards specific to mobile systems will move to the 3GPP Terminals TSG.

ETSI announced the distribution of the specifications of the 3GPP Confidentiality and Integrity algorithms. More information can be found at: http://www.etsi.org/dvbandca/

Technology news

LinkAir Communications has successfully completed the first call using its LAS-CDMA (Large Area Synchronised-CDMA) technology. According to LinkAir representatives, LAS-CDMA offers the opportunity for wireless operators to expand voice coverage by over 20 times that of existing 2G systems, while increasing data speeds to 5.53 Mbps. LAS-CDMA is said to be compatible with GSM and CDMA networks, as well as the major international 3G standards.

Nanotron, a German company, has developed a new multiple-access wireless technology, named Multi-Dimensional Multiple Access (MDMA). The technology is based on double-spreading principles and provides a low-cost route to higher throughput through the optimisation of alloted spectrum and improvements to noise immunity. The double-spreading technique combines the flexibility of TDMA with the quality of CDMA to enhance channel capacity.

Japan is said to approve faster data rates over its Personal Handyphone System (PHS) technology. PHS phones are actually permitted to transfer up to 128 kbits/s. A source of the Ministry of Posts and Telecommunications said that it was likely to rule in favour of higher rates allowing 3G style services over the PHS technology.

Japan Telecom and Ericsson claimed they have successfully completed the world's first field trial of Voice over IP over WCDMA. The trial was made over Japan Telecom's WCDMA experimental system by running Ericsson's new robust header-compression algorithm, called Robust Checksum-based Header Compression (ROCCO).

IBM will introduce its first I-series notebooks with an 802.11 wireless LAN chip mounted directly on the laptop's motherboard. IBM will also offer a Bluetooth PC card option to connect to other mobile devices.

Wi-LAN Inc claimed to have jointly developed with Philips Semiconductors a prototype ASIC chip which use Wi-LAN's patented Wideband Orthogonal Frequency Division Multiplexing (W-OFDM) technology. Wi-LAN is planning to develop faster FPGAs and ASICs to exceed the 54Mbps of IEEE802.11a and ETSI BRAN HiperLAN/2. Wi-LAN targets to demonstrate rates of 90Mbps this year and 155Mbps in 2001.

Moscow Cellular Communications (MCC) has been undertaking field trials of a 400 and 1800 MHz GSM network in Moscow city and its environment. The company believes that GSM 400/1800 is the optimal platform for migration to 3G services in Russian conditions.

Advanced Communications Technologies, an Australian company, is completing a multiple protocol operating system for wireless products, named SpectruCell. The unit has been designed with a new architecture capable within one network of processing and transmitting a variety of communications protocols (e.g., AMPS, CDMA, TDMA, GSM, UMTS...).

Nokia will support Java technology in a selection of its future handsets. The company, which joined the Executive Committee of the Java Community Process, will firstly implement Java technology in the EPOC based smart phones and communicators. The first products should be available in 2001.

GEO Interactive Media Group would establish with TVResource the first mobile phone portal for providing video content over wireless infrastructure.

NTT DoCoMo announced it will start trials of an IP Core Network in Japan. The trials should begin beginning of September and will conclude in March 2001. Cisco Systems, Motorola and Xybridge Technologies will be participating in the trials.

The IEEE's Task Group on Broadband Wireless Access (IEEE 802.16.1 Task Group 1) has accepted advanced Block Turbo Coding (BTC) schemes for inclusion in its Air Interface for the Fixed Broadband Wireless Access (BWA) standard.

Mobile satellite communications

Motorola announced it was finalising a schedule to destroy the satellites of Iridium LLC after failing to find a qualified buyer in the last months. This move comes after the withdrawal of Castle Harlan's offer due to the doubts about the capability of producing steady revenues with the system. However, California-based CMC International is said to have lately submitted a $30 million offer to acquire the Iridium satellite constellation, facilities in Reston, Virginia and other assets. In the meantime, Iridium LLC has already unplugged users in the US from the public switched network. Only calls between Iridium users, through the satellite network, are still possible.

Telia Mobile (Sweden) closed an agreement with Globalstar Northern Europe for the Swedish market giving its GSM customers access beyond Telia's coverage. Telia's costumers can use a dual-mode handset to switch from the GSM 900MHz network to Globalstar's network. Globalstar

has also expanded its Latin America coverage in Brazil and Chile. Globalstar do Brazil launched the second of three planned gateways, providing Globalstar service to the north-eastern region of the country.

ICO-Teledesic global satellite venture announced a $1 billion cash injection from investors including Bill Gates, Clayton, Dubilier & Rice and McCaw's Eagle River. According to the holding company, new ICO services are planned to start in 2003. ICO will offer IP-based mobile and fixed broadband services. Teledesic, which will offer broadband data and services over a global network, is said to start its services late 2004.

WAP news

The debate on the slow adoption of WAP compared to other systems, like i-mode, continues. Despite the criticisms, the development of the technology goes ahead. Contents and applications are seen as a key factor for success. Finnish operator, Sonera, will start this autumn its M-Space project. The idea is to isolate a group of the most forward-thinking consumers and create a kind of virtual laboratory to test out mobile data content and application services. A set of airline companies (Swissair, Finnair, SAS and Cathay Pacific) are experimenting with WAP technology to allow their costumers to book seats, check in and receive information about the status of their flights.

Singaporean mobile operator M1 claimed to have launched the world's first roaming service for WAP. Users can now access the system while travelling to Hong Kong without paying international call charges. Lycos launched a service called Lycos Anywhere that also includes what the company claimed to be the first WAP-based search engine. Nokia is releasing the source code for its WAP browser version 2.0 to speed development of the mobile Internet. The WAP browser is an upgraded software that supports the WAP 1.2 specification. Geoworks Corp. released its revised terms of its licensing program concerning its Flexible User Interface patent, supposedly used by anyone building or deploying WAP products or services.

South Korea scraps subsidies on mobile phones

Mobile phone operators agreed to government plans and scrapped subsidies on mobile phones. The operators took the decision because of the big investments needed for 3G systems. The government initiative was launched because the Korean industry has been relying on imported components that represent 50 to 60 percent of the price of each handset. A high proportion of the financial benefit of the subsidies paid by Korean operators is then going to foreign chip suppliers. Two months after the decision, the number of mobile telecommunications subscribers dropped by 1 million, going from 27.32 million to 26.19 million subscribers.

Uncertainty continues on which 3G standard will be adopted for the deployment of 3G networks in South Korea. Existing operators have already said they will favour WCDMA but the Government and some mobile phone manufacturers would prefer to have WCDMA and cdma2000 networks.

Spectrum licensing

After 14 days of bidding and 173 rounds, six companies obtained a UMTS license in the German auction. The auction has raised $45.85billion. Each winner won a 2×10 MHz block of spectrum. The winners are: T-Mobil (Deutsche Telekom), Mannesmann Mobilfunk (Vodafone Airtouch), Mobilcom Multimedia (Mobilcom and France Telecom), Viag Interkom (British Telecom), E-Plus Hutchison (KPN and Hutchison) and Group 3G (Telefonica and Sonera). Debitel (Swisscom), owner of a GSM license and that dropped out of the race for a UMTS license, is said to be in talks with the other winners. Group 3G could be one of the favourite candidates as it is the only winner that is not already operating in Germany. The surprise came when Hutchison withdrew from the E-Plus Hutchison consortium after winning a license. The reasons were apparently the high prices and the small amount of spectrum won. KPN and Hutchison wanted 2×15 MHz blocks of spectrum and had planned to build the network together but offer services separately.

Seven applicants have been accepted in the Italian UMTS auction. These applicants are: TIM (Telecom Italia), Omnitel (Vodafone Airtouch), Blu (British Telecom), Wind (France Telecom), Ipse (Telefonica and Sonera), Andala (Hutchison Whampoa) and Tu Mobile. An eight applicant, Anthill, was rejected in part due to its lack of experience in the telecommunications sector. Surprisingly, Deutsche Telekom will not participate in the auction. A possible reason for this decision is the maturity of the Italian wireless market. Five licenses in Italy will be awarded via a two-stage process, combining an initial "beauty contest" with an auction. The auction is scheduled to start on October 2. The Italian government has already set a base price of $1.95billion per license.

The Spanish government has been under criticisms for the lack of transparency in the "beauty contest" used to award four UMTS licenses, and because of the small revenue of the contest (500 million euros) compared with other European countries that adopted the auction method (50 billion in Germany). As a result, the government is thinking of selling additional 3G licenses and levying additional charges on the winners of the "beauty contest". Potential bidders of the new license have already criticised the fact that the additional license could be auctioned. The "beauty contest" winners have criticised the possible additional charges and threatened they could rethink their business plans and investments.

The Dutch UMTS auction ended raising $2.5 billion, far lower than what the Dutch government expected. Libertel, KPN Mobile, Dutchtone, Telfort and 3G Blue won a license.

Japan granted 3G licenses to three operators, NTT DoCoMo, J-Phone and DDI. DoCoMo is expected to launch its service, based on WCDMA, in May 2001. KDDI, the former company to be formed by the merger of DDI, KDD and IDO, announced it plans to launch 3G services based on cdma2000 in autumn 2002. In autumn 2001, the company plans to launch 1X, an extension of cdmaOne. J-Phone is planning to launch its service based on WCDMA in the third quarter of 2001.

Sweden has received ten bids for the four UMTS licenses to be awarded this November, through a beauty contest. The Swiss government also cleared 10 groups to bid for their four UMTS licenses that will be awarded in an auction starting this November. In Norway, seven groups have been finally admitted for the "beauty contest" that will award the four UMTS licenses. New Zealand announced they received 12 bids for their 2 GHz auction, which will include licenses for 2G and 3G systems.

After receiving complaints from Bouygues Telecom and Versatel, the European Competition authorities are investigating whether 3G licence auctions in some European countries have breached state aid regulations. The Commission will also look at whether licenses given at a low cost, as in the case of the "beauty contest", could represent a form of illegal state aid. Mr Kurt Hellstroem, president of Ericsson, warned that the cost of 3G licenses would increase financial risks for mobile phone manufacturers. According to Mr Hellstroem, network operators would be certain to pass on the costs of the 3G licenses to manufacturers to minimise their own risk. Dr Ron Sommer, chairman of Deutsche

Telekom, also said that the high cost for 3G licenses will not lead to the broad competition desired, but will cause consolidation in the industry. Senior executives at Crown Castle UK, said that the high costs for 3G licenses will force mobile operators to share base station infrastructure and other common services.

Anatel, Brazilian telecomm regulator, decided to sell Personal Communications Services licenses in the 1800 MHz band. The decision is a boost to the development of GSM technology in Brazil and a blow to TDMA and CDMA technology, which proposed the 1900 MHz band.

NextCom, one of the six bidders for the third mobile phone license in South Africa, won a court order barring the South African government from ruling on a recommendation that Cell C (backed by GTE) should be awarded the license. Also, South African's telecomm regulator decided to postpone the access to the 1800 MHz frequency to the two existing operators.

France has awarded two 15-year national wireless local loop licenses to FirstMark Communications and Fortel, aiming to boost competition and investments in broadband Internet networks. The UK government has invited applications to bid for broadband fixed wireless licenses (a total of 42 licenses). The auction process is said to start mid-October. The licenses, allocated in the 28 GHz band, will have each one a bandwidth of 2×112 MHz. Thirteen companies have entered the tender process for the allocation of three fixed wireless access network licenses (in the 26 GHz band) in the Czech Republic.

For information on US spectrum licensing issues, please refer to the following section 'FCC news.'

FCC news

The Federal Communications Commission (FCC) of the US postponed until 6th March 2001 the auction of licences in the 747-762 and 777-792 MHz band, scheduled to begin on the 6th September 2000. This decision was taken in order to provide additional time for bidder preparation and planning. The delay had previously been requested by a large number of potential bidders. The commission also adopted as series of changes to its rules for upcoming C and F block auction. The changes seek to preserve opportunities for small businesses and to promote the rapid deployment of wireless services across the country. The commission removed the financial eligibility restrictions for some C and F block licences. Details on these changes can be found at: http://www.fcc.gov/Bureaus/Wireless/News_Releases/2000/nrwl0028.html

The FCC also adjusted rules to allow companies access to wider bands of certain airwaves for the broader use of wireless applications. According to the FCC Chairman, "it will permit the introduction of wide band frequency hopping technology that will lead to new and innovative devices".

The 800 MHz Specialized Mobile Radio service (SMR) auction ended beginning of September. The auction, which ended after 76 rounds, raised $319.4 million. 1030 licenses were sold to 14 winners and only 23 licenses remained unsold. The licenses may be used to provide wireless SMR services including dispatch, mobile telephony and wireless data services. The SMR bandwidth can also provide two-way acknowledgement paging and inventory tracking, credit card authorization, fleet management, voicemail, automatic vehicle location, remote database access and facsimile services.

The FCC adopted rules for the next generation of mobile satellites systems, late in August. The systems under consideration include geostationary and non-geostationary orbit systems covering the whole US, including rural areas. The service covers 70 MHz in the 1990-2025 MHz and 2165-2200 MHz bands.

The FCC has adopted steps to implement the Wireless Communications and Public Safety Act of 1999. The act aims at enhancing public safety by encouraging and facilitating the prompt deployment of nation-wide, seamless communications systems for emergency services. The FCC has designated 911 as the universal emergency number.

TETRA

A series of commercial contracts highlight the worldwide acceptance of TETRA (Terrestrial Trunked Radio), a digital Private Mobile Radio (PMR) and Public Access Mobile Radio (PAMR) technology. Telefonica Móviles awarded Motorola the first nationwide TETRA infrastructure contract for commercial deployment in Spain. In South Africa, Alcom, a subsidiary of the Altech group, has been awarded a contract, by the Cape Metropolitan Council, for the supply of a TETRA digital two-way radiocommunications infrastructure. The system will be the first PMR network deployed in South Africa. The North American TETRA Forum (NATF) was welcomed as a member of the TETRA MoU Association. One of its goals will be to bring TETRA to North America.

Trade and business news

Motorola has acquired Printrak, a software supplier for the public safety industry. The deal will boost Motorola's public safety and civil customers portfolio. Printrak will provide software to improve the dispatching of emergency services using Motorola's radio products.

Japanese operator DDI announced its plans to merge seven of its mobile phone units, under a new company called au Corp., in a attempt to compete with the dominant operator, NTT DoCoMo.

Phone.com Inc, a provider of wireless internet infrastructure and application software, and Software.com Inc., a provider of internet infrastructure software for fixed and wireless service providers, revealed their plans to merge. The combined company will focus on providing software to wireline and wireless operators, portals and Internet Service Providers.

Deutsche Telekom AG entered the US mobile market by acquiring two wireless operators, VoiceStream Wireless Corp and Powertel Inc. The deals will give DT an important presence in the US as VoiceStream has licenses across the country and Powertel has an important presence in the Southeast. Moreover, both companies use the European standard GSM. These deals provoked many concerns in the US Congress because of the important stake the German government holds in DT.

Telefonica Móviles España and Motorola have set up, in Madrid, a joint Applications Development Centre for wireless applications and services. The centre will be oriented towards new user mobile applications, and will incorporate service and infrastructure enhancements, for WAP, GPRS and future 3G networks.

Orange bought Ananova news Web site from the UK's Press Association. Orange would be planning to use the virtual newscaster to broadcast over its mobile phones. Orange also announced that it will delay the launch of the first GSM mobile videophone until the last quarter of this year.

Qualcomm announced it will split its operations in two. Qualcomm will spin off its business developing chips and software for mobile phones. The new business unit, temporarily named Spinco, will concentrate on developing chips and software for mobile phones regardless the underlying technology. This spin off is justified by Mr Sulpizio, chief executive of Spinco, because "the future of the wireless industry will be multi-mode products". The move comes after increasing difficulties by Qualcomm to establish its 3G

technology, cdma2000, as the industry standard. Qualcomm also agreed to sell to Sierra Wireless Inc. its CDMA module business, including its module inventory, manufacturing and customer commitments. Sierra Wireless has also signed a supply agreement for CDMA modules with Qualcomm's Wireless Business Solutions division.

AT&T Wireless announced deals to acquire wireless systems in San Diego, San Francisco Bay-area and Houston markets, expanding significantly its wireless network. The systems will be acquired from GTE, Vodafone Airtouch and PrimeCo PCS.

Alcatel and Fujitsu announced they finalized the agreements to create a new company to develop next generation mobile communication networks. The new company, Evolium SAS, will be based in France and will be responsible for product definition and R&D of 2G and 3G networks.

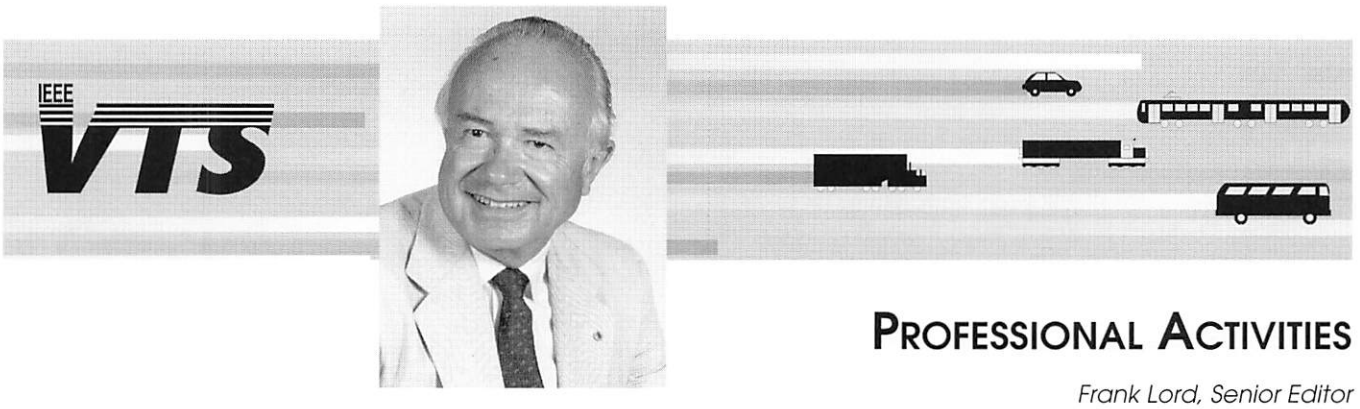
Nortel Networks unveiled its Wireless Internet strategy, "Wings of Light", that is based on the unification of its IP, optical and wireless internet capabilities. The company also announced an alliance with Hewlett Packard to help implement the strategy. The deal also comprises a mobile portal solution using HP's WAP e-services platform.

Siemens also unveiled some aspects of its mobile communications strategy. Siemens will outsource part of its mobile handset production to Flextronics International Ltd, a Singapore company, in order to satisfy the increasing demand. Siemens is also planning to increase considerably the capacity of its German and Chinese facilities.

Ericsson Mobile Systems also announced plans to reorganise its business units to increase its competitiveness in the 3G market. The company will have three units (WCDMA, CDMA and EDGE) for mobile systems. The other units are Special Business Operations and Transmission Mobile Systems. Ericsson is also considering to externally source lower cost handsets.

Texas Instrument acquired Dot Wireless Inc, a company developing and marketing 3G CDMA technologies, software and transceiver reference designs for convergence of data and wireless communications services. The deal will help TI to expand its portfolio for Digital Signal Processors and analog-enabled wireless solutions for 2.5G and 3G systems.

The Hong Kong conglomerate, Hutchison Whampoa, confirmed it will sell 35% of its UK mobile phone company (joint owner of a 3G license with TIW) to KPN (Netherlands) and NTT DoCoMo. The Japanese carrier is said to buy 20% stake while KPN will buy the remaining 15% stake.



PROFESSIONAL ACTIVITIES

Frank Lord, Senior Editor

I participated in the IEEE-USA Professional Development Conference (PDC) in Scottsdale, Arizona for the Labor Day weekend. Up to this time the event was called the PACE (Professional Activities Committee for Engineers) Conference and was more for the purpose of addressing matters that affect engineers' careers; but that are outside the realm of their technical specialities. Portable pensions and tax treatment of the cost of continuing education are examples.

The PACE Conference tended to focus on the activities of the 35 or so committees that report to the IEEE-USA Board of Directors. It also involved training of members new to this arena. Now the focus has changed to a broader treatment of the areas of concern while suggesting that engineers might have to be alert to such factors and may have to take individual action on their own behalf on occasion. It was thought that this modified approach would be more appealing to general membership and thus be of more value to more members.

With the advent of the PDC, the hardback book form for the conference proceedings was introduced. This year a 283 page volume presents 38 papers arranged by topics, Leadership, Engineering Management, Skills, Gold (Graduates of the Last Decade) Skills, Gold Careers, Woman in Engineering and PACE. The book also contains an author index and contact information.

This book may be obtained in the IEEE-USA office for $35 including shipping.

Contact:
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Now that we have held two PDCs in lieu of PACE conferences, many veteran contributors have pointed out that the resources that could be applied to situations that affect most of our United States membership are diminished. As a result of these inputs the IEEE-USA Board has decided that the next year the main meeting will be structured to a greater extent in the PACE format and will emphasise activities that address the many external influences that affect our profession and members.

One such item that has developed into major proportions this year has had its start in the Autumn of 1999 when representatives of the National Conference on Commissioners for Uniform State Laws (NCCUSL) and major software interests created a draft Uniform Computer Information Transaction Act (UCITA), an act that would favor one sector of industry at the expense of other organisations, thousands

of technologies, and millions of users. UCITA gives no consideration to the common good.

IEEE-USA has had in place for many years a system for handling such situations. The appropriate committee and the Board develop a position paper. When approved it becomes the guidance for subsequent action. It makes it easier to proceed with appropriate moves as opportunities occur. These are probably over 100 such position papers in force and they are subject to periodic review. Any member may obtain a list of position papers in force and may request copies of these of interest by communicating with IEEE-USA. Members with Web access can find them at http://www.ieeeusa.org/forum/POSITIONS

The UCITA Position Paper, approved by the IEEE-USA Board of Directors in February 2000, is as follows:

Opposing Adoption of the Uniform Computer Information Transactions Act (UCITA) By the States

On behalf of The Institute of Electrical and Electronics Engineers - United States of America (IEEE-USA) and its nearly 240,000 U.S. members who are electrical, electronics, computer and software engineers, we wish to reiterate to the state legislatures the concerns regarding the Uniform Computer Information Transactions Act (UCITA) that we previously expressed to the National Council of Commissioners on Uniform State Laws (NCCUSL).

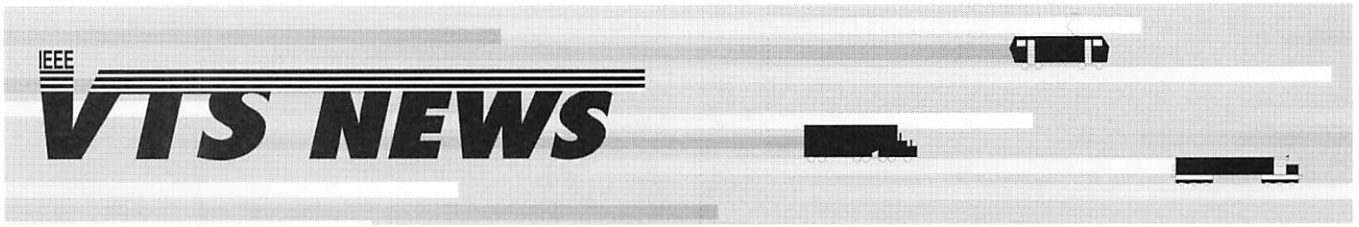
We believe UCITA should be rejected by the states. UCITA would have a widespread, complex impact including: (a) its interaction with the existing statutes, principles, and interpretations of Federal intellectual property law; (b) the provisions currently found in "shrink wrap" and "click-through" software agreements – many of them questionable or unenforceable under current law – that UCITA seeks to make enforceable; and (c) UCITA's effect on existing business practices and reasonable purchaser expectations. Into the existing and evolving legal and business situation, UCITA would inject an ironclad statutory framework that is very easy to abuse to the serious detriment of consumers, large business users, and small business users of computer software, software developers, computer consultants and the general public.

Many organizations, including 24 state Attorneys General, the staffs of the Bureau of Competition, Bureau of Consumer Protection, and Policy Planning Office of the Federal Trade Commission, professional and trade associations, consumer groups, the American Law Institute (originally NCCUSL's partner in drafting UCITA), and others have expressed opposition or concern regarding UCITA. In some cases the concerns of these organizations parallel ours, and in other cases they raise additional issues. Our concerns are in the following areas:

1. By changing what would otherwise be considered a sale into a licensing transaction, UCITA permits software publishers to enforce contract provisions that may be onerous, burdensome or unreasonable, and places on the purchaser the burden and cost of proving that these provisions are unconscionable or "against fundamental public policy." Examples of these provisions include prohibitions against public criticism of the software and limitations on purchasers' rights to sell or dispose of software. The first provision prohibits the reviews, comparisons, and benchmark testing that are critical for an informed, competitive marketplace. The second issue could legally complicate transactions including corporate mergers/acquisitions, sales of small businesses, the operation of businesses dealing in second-hand software, and even yard sales.
2. UCITA would undermine the protections provided by Federal intellectual property law and upset the carefully achieved balance between owners and purchasers of intellectual property. For example, one major protection is that "fair use" case law and statutory copyright law permit "reverse engineering" for certain important purposes, such as development of compatible (interoperable) software products and information security testing. Reverse engineering is the examination of software to identify and analyze its internal elements. Current shrink-wrap agreements often contain strict provisions forbidding reverse engineering. By making these provisions enforceable, UCITA would stifle innovation and competition in the software industry, and would straightjacket efforts of users to provide information security protection for their systems.
3. UCITA allows software publishers to disclaim warranties and consequential damages even for software defects known to the publisher prior to sale, undisclosed to the buyer, and having damages that can be reasonably foreseen. For example, under UCITA a software publisher could not only prohibit publication of information on security vulnerabilities that users identify but could avoid responsibility for fixing these vulnerabilities.
4. By legalizing the choices of law and forum often included in software agreements, especially shrink-wrap and click-through, UCITA would allow software publishers to make expensive and burdensome any efforts by purchasers to protect their rights. This includes issues that for a sale would be handled in local small-claims courts.
5. The "self-help" provisions of UCITA would allow software publishers to embed security vulnerabilities and other functions in their software that facilitate "denial-of-service" attacks (remote disablement or destruction of the software) while avoiding liability for accidental triggering of the attacks or exploitation of these functions by malicious intruders.

We urge the state legislatures to reject UCITA.

To overturn the original item, we opponents must present our views to each state separately and obtain their concurrence with our opposing view. There is not a dedicated network in place ready to go into action on this huge effort. We would most likely utilise our Regional/Section structure. Members will probably learn more of the needs through that path. Volunteers will be essential for us to be successful. Interested members are urged to watch for more information and become involved. You may want to ask your Section PACE Chairman for more information. You may learn more, as the conference attendees did through the 51 page document *Opposing Adoption Of The Uniform Computer Transactions Act (UCITA) by the States, A Grassroots Information Kit for Concerned IEEE US Members*, dated 28 August 2000. This document can be found at the web address http://www.ieeeusa.org/grassroots/ucita/ucitakit.pdf



VTS Board of Governors Election Results

This ballot for year's IEEE VTS Board of Governors election closed on the 18th of September. The VTS has 15 Governors, with each Governor serving for a term of three years. This means that there are five positions to be filled each year.

This year's successful candidates were:

Robert L. French
Robert A. Mazzola
George F. McClure
Gordon L. Stüber
Raymond C. Trott.

Robert French, Robert Mazzola, George McClure, and Raymond Trott are existing members of the Board of Governors. Professor Gordon Stüber is with the Georgia Institute of Technology, and is also Vice President for Research with WiLAN, Inc. His main research interest is in wireless communications and communications signal processing; he is author of a textbook on the subject, "*Principles of Mobile Communications*". He was Technical Programme Chair of VTC'96, which was held in Atlanta, and is co-chair of the 2000 IEEE Workshop on Multimedia, Multiaccess and Teletraffic for Wireless which will be held in Florida later this year.

Professor Stüber will take the position of Mel Lewis, who will retire from the Board of Governors at the end of the year. Mel Lewis has been Conference Coordinator since 1994, and has overseen a period of considerable expansion in the conference activities of VTS, from the first VTC held outside the USA (in Sweden in 1994), to the expansion to two VTCs per year in 1999. Conference attendance across the two conferences is now averaging three times the figures of the single conference in the early 1990s. The conference handbook he maintains (which is available on the VTS web site), allows lessons from each conference to be fed in to subsequent ones, which contributes to their success.

Mel Lewis has also been active on the education committee of the VTS, resurrecting it from its dormant state and organising a wireless networking course. He now has a profession interest in the subject, having recently returned to his *alma mater*, Fairleigh Dickinson Univ., of Teaneck, NJ to take up a faculty position.

VTS Executive Committee Elections

Elections were also undertaken at the September Board of Governors meeting for the Executive Committee for 2001. Society President, Kent Johnson, having served two terms is not eligible to stand again, and J. R. Cruz was elected to serve as President from 1 January 2001. Dennis Bodson will be the new Executive Vice President. The other executive positions are unchanged. J. R. Cruz will vacate the position he currently holds as Editor of the Transactions from the end of the year, to be replaced by Greg Bottomley from Ericsson.

IEEE Xplore

The IEEE's new web-based on-line electronic library, IEEE Xplore™, is now up and running. The system is an amalgam of the OPeRA (Online Periodicals and Research Area) and Bibliographies Online (the collection of IEEE abstract and citation records) into a system that provides both and is easier to use.

The system allows access to tables of contents, abstracts and full papers dating back to 1988. There are three access levels. Everyone, including non-members, can access the most basic level which allows the searching of tables of contents of IEEE transactions and conference publications, IEEE Spectrum, and the IEEE/IEE electronic library. IEEE members, irrespective of which societies they belong to, can access the next level, which allows access to full text articles of the IEEE Spectrum, as well as the ability to search and view abstract and citation records. The third level of access is society dependent, and depends on the subscription you have to different publications. Societies can choose to allow their members to access their publications on-line, and the VTS has done so for the Transactions in Vehicular Technology. This means that VTS members who are current subscribers have access to all VT Transactions articles back to 1988.

The system allows for the browsing of table of contents as well as searching for particular authors. The articles are available in PDF format, although more recent articles (since 1996), are also available in searchable HTML format. The full text of these articles will also include links from their reference lists to other articles in the database, making searching easier.

IEEE Xplore is accessed through an IEEE web account, so you have to set one up to use the system. However, once this has been done, the system is intelligent enough to know all your society memberships and give you the correct access to publications, saving the requirement to keep separate details for different subscriptions.

Dan Noble Fellowship

Angela Kaczmarski, from the Illinois Institute of Technology, has been awarded the Daniel E. Noble Fellowship. The Graduate Fellowship in Electrical and Electronic Engineering, which has a value of $7500, is jointly established by the IEEE VTS and Motorola as a memorial to Daniel E. Noble, in recognition of his valuable contributions to the development of two-way vehicular communications and solid state technology. Recipients of the award are selected by a committee on the basis of the candidate's potential to contribute to the profession of Electrical and Electronic Engineering, specifically in the technology areas covered by the VTS.

Convergence Fellowship

Mr. Jean Yves Routex, a French student currently studying at Texas A&M University, is the awardee for the 2000-1 Convergence Fellowship. The graduate fellowship in Transportation Electronics was been established jointly by IEEE VTS and the CONVERGENCE Education Association to support a student for one year of graduate study. This fellowship, which has a yearly stipend of $12000, is awarded biannually at the CONVERGENCE Conference.

Mr. Routex received a bachelors degree with honors from Math sup/Math Spe (France) in June 1997, and a masters degree in Electrical Engineering from ENSIEG-INPG (France) in June 2000. He is currently enrolled at Texas A&M where he is pursuing a masters in Electrical Engi-

neering as a research assistant in the Texas A&M Advanced Vehicle Group. As part of his research, he has presented a paper for VTC 2000-Fall on Modeling of Hybrid Electric Vehicles Using Gyrator Theory, which allows modelling of hybrid vehicles containing an electric motor and an internal combustion unit by an equivalent electrical circuit, simplifying design.

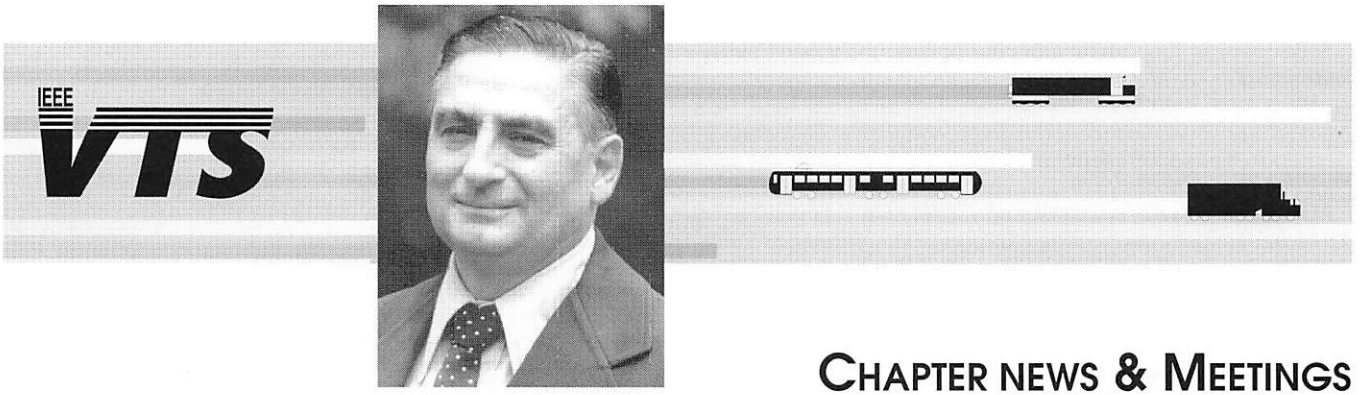
A career objective of Mr. Routex is to perform research on hybrid electric vehicles.

New VTS News Senior Editors

With this issue we welcome two new Senior Editors to the staff of the VTS News.

Dr Dennis Bodson, Chair for the VTS Standards Committee, will report on the standards activity of the VTS. Standards activity is a very important area of the work of the Society and the IEEE more generally, but due to the lengthy and detailed nature of the work it goes relatively unreported. Dennis Bodson's column will provide a focus for standards activity in the VTS News. His first column appears on page 22, and our feature article in this issue looks at worldwide standards activities towards 4th generation mobile radio.

Dr Dirk Pesch, from the Cork Institute of Technology in Ireland joins us to co-ordinate book reviews. This is an area identified by members as being something they would find useful in the VTS News. If you are interested in helping with book reviews please contact Dirk Pesch at the address given on Page 2. If you responded to the VTS News questionnaire expressing an interest we will be in touch with you, but some people who answered on the web did not give contact details, so drop us a line if you haven't heard anything.



CHAPTER NEWS & MEETINGS

Gaspar Messina, Senior Editor

Note to VTS Chapters

VTS Chapters world-wide are eligible to receive $100.00 U.S. at the end of the calendar year for submitting L-31 Meeting Attendance Forms reflecting their Chapter's periodic meeting to VTS Chapter Activities Chairman.

Gaspar Messina,
9800 Marquette Drive,
Bethesda, Maryland 20817, U.S.A.

New Society Speaker

Our Senior Editor for Automotive Electronics, William J. Fleming from TRW Vehicle Safety Systems of Washington, MI, has joined the society speaker programme.

William Fleming earned his Ph.D. degree and MSE degree in Electrical Engineering from the University of Michigan in 1971 and 1966, respectively. He currently is a senior staff technologist at TRW Occupant Safety Systems in Washington, MI, where he is developing new safety-restraint products, and doing related studies involving risk-analysis and new technology. Before this, for five years, at TRW Automotive Electronics Group, he developed new types of sensors and actuators for use in automotive control systems. Prior to TRW, for eleven years, he did sensor development for automotive engine-control systems, at General Motors Research Laboratories. Dr. Fleming was the recipient of the Vincent Bendix Award for best SAE paper on automotive electronics. He also received the Avant Garde Award from the IEEE Vehicular Technology Society. Since 1974, and continuing through present, he serves as Automotive Electronics Senior Editor for the *IEEE VTS News.*

The following talks are available from Dr. Fleming.

1. Automotive sensors and actuators used in powertrain systems. Powertrain systems include: (a) engine controls, (b) transmission control, and (c) on-board OBD-II diagnostics-sensing.
2. Automotive sensors and actuators used in chassis systems. Chassis systems typically include: (a) ABS braking, (b) electric power steering, (c) stability-enhancement chassis control, and (d) active suspension control.
3. Automotive sensors and actuators used in body systems. Body systems include: (a) air bag crash sensing and occupant sensing, (b) vehicle collision avoidance, (c) adaptive cruise control, (d) intelligent transportation/automated highways, (e) comfort/convenience systems, and (f) anti-theft, intrusion alert, systems.

These talks are excerpted from a 3-day, seminar, titled: *Sensor & Actuator Technology.* This 3-day seminar is offered four times annually, at various U.S. locations, by SAE (Society of Automotive Engineers) International, Warrendale, PA. Since its creation in 1995, over 600 persons from automotive and electronics industries have attended the seminar.

The other speakers available in the programme are Linda Sue Boehmer and Al Gross.

Philadelphia, Pennsylvania

This chapter has held two meetings recently. The first, on June 7, 2000, was a Tour of SEPTA's Control Center with speakers Mr. Dan Bidwell and Mr. Mark Glassen from the South East Philadelphia Transit Authority, as hosts. Then on September 13, 2000, Mr. David Strong, from Booz, Allen and Hamilton presented a paper on JFK Airtrain – Project Status in the Systems Areas. A total of 47 people attended both meetings including 28 guests.

VTS AWARDS

Ray Trott, Awards Chairman

The VTS recognizes those who contribute to & support VTS in an exceptionally worthy manner. There are several awards and fellowships that VTS considers in expressing its appreciation to members of the Society. Although all of these awards are considered, not all are awarded annually. These awards also have differing prizes: Plaques, Certificates and/or money.

With two Vehicular Technology Conferences held this year, in opposite corners of the globe, some awards were presented in Tokyo and some in Boston.

Chapter of the Year Award - This award is presented to recognize the outstanding Chapter of the Vehicular Technology Society. To be eligible, a Chapter must submit to IEEE Headquarters the meeting attendance report form, L-31. The award is a plaque.

The 1999 winner was for an un-precedented third year in a row, the Tokyo VTS Chapter. The award was presented to the 1999 Chairman of the Tokyo Chapter, Professor Masyoshi Aoki.

Special Service Award These are awarded outstanding performance to the society. Ramjee Prasad was presented with such an award at VTC in Tokyo for the planning and execution of the VTC Fall 1999, September 19 to September 22, 1999, Amsterdam, The Netherlands.

At VTC2000-Fall in Boston there were two such awards, to Dr Kumar Krishen, for the organisation of VTC'99-Spring in Houston, and to Prof Mitsutoshi Hatori, chair of VTC2000-Spring 2000 in Tokyo

Avant Garde Awards These awards are given to recognize leadership and continuing contributions in promoting new technology in the field of vehicular communications and electronics.

Dr. Sadao Takaba - For his role in the development of traffic measurement technologies.

Dr. Fumiyuki Adachi – For his leadership role in radio access technology and development of W-CDMA technology.

IEEE Third Millennium Medals As part of the celebration of the Third Millennium, the IEEE is awarding approximately 3000 IEEE Millennium Medals and certificates to IEEE members who have been selected by IEEE societies, sections, regions and major boards for outstanding contributions in their respective areas of activity. The Vehicular Technology Society nominated 17 of its members for the medals:

Linda Sue Boehmer ‡
J. R. Cruz †
Robert E. Fenton ‡
Robert L. French †
A. Kent Johnson †
Trevor O. Jones
William C. Y. Lee †
Samuel A. Leslie ‡
Roger D. Madden ‡
Robert A. Mazzola ‡
Samuel R. McConoughey †
Robert W. McKnight ‡
Evan B. Richards ‡
Thomas N. Rubinstein †
Eric J. Schimmel ‡
Raymond C. Trott
Jan E. Uddenfeldt ‡

Members received their medal in Tokyo (†) or Boston (‡), with Trevor Jones receiving his medal at Convergence 2000.

Neal Shepherd Award for the Best Propagation Paper This was awarded to Jean-Yves Chouinard, Francois Patenaude and John Lodge from Canada for their paper, "*Eigen Analysis of Wide-Band Fading Channel Impulse Responses*" published in the March 1999 Transactions in Vehicular Technology. They received their award at the Boston conference.

Tokyo Section Paper Awards The Tokyo Chapter of VTS presented paper awards at the Awards Luncheon at VTC2000-Spring.

Kai-Kit Wong, Sai-Kit Lai, R.S-K Cheng, K.B.Letaief and R.D.Murch, The Hong Kong University of Science and Technology, for "*Adaptive Spatial-Subcarrier Trellis Code MQAM and Power Optimization for OFDM Transmission*".

Kuenyoung Kim and Youngnam Han, Information and Communications University, for "*A Call Admission Control with Thresholds for Multi-rate Traffic in CDMA Systems*".

Thomas Hunziker and Dirk Dahlhaus, Swiss Federal Institute of Technology, for "*Iterative Symbol Detection for Bandwidth Efficient Nonorthogonal Multicarrier Transmission*".

Stuart Meyer Memorial Award This special VTS award was presented at the Banquet at the Tokyo Conference.

The Stuart Meyer Memorial Award is an award to recognize those members of the Vehicular Technology Society who have both served their Society and also have contributed to the development of radio technology and science in an outstanding and exemplary manner. Stuart Meyer was a pioneer in the Vehicular Technology Society. He provided a level of service unequaled in the history of VTS. Candidates must exhibit a level of service approaching what Stu Meyer had provided before they will be considered. The prize is a

Raymond Trott presenting millennium medals to (clockwise from top) Linda Sue Boehmer, J. R. Cruz, Robert E. Fenton, Robert L. French, A. Kent Johnson, William C. Y. Lee, Roger D. Madden, Robert A. Mazzola, Samuel R. McConoughey, Robert W. McKnight, Evan B. Richards, Thomas N. Rubinstein, Eric J. Schimmel and Mr Eriksson, who received the award for Jan E. Uddenfeldt

plaque and a stipend of $2,500 which is provided by both Ericsson, Inc. and IEEE VTS.

This award was presented to Dr. Kenkichi Hirade, Tokyo, Executive Vice President of Japan Radio Corporation. Dr. Hirade received his BS, MS and PhD degrees in Electrical Engineering from Nagoya University. For most of his career, he worked for Nippon Telegraph and Telephone Corporation where he was a leader in the development of digital radio systems which included satellite and high capacity digital cellular systems. During 1989-1991, he was a project leader of the development of NTT's pocket-sized portable radio telephone unit named "MOVA". He has had heavy involvement as an officer of the Tokyo VTS chapter. His accomplishments include many VTS published papers and VTS related patents.

New Member Survey

The Board of Governors of the IEEE Vehicular Technology Society invites new IEEE VTS members to complete this survey. A forthcoming survey will be aimed at members who have been members for more than one year.

The survey form is available on the web at:

http://survey.vtsociety.org/

Electronic Communications

Tom Rubinstein

Web Stuff

The VTS will shortly be moving its Web Server. To anticipate this change, we encourage those who have not been using our alias to begin doing so immediately. The URL for the alias is http://www.vtsociety.org Once the new server is working properly, we will re-direct the alias to the new server. If you start using the alias now, the migration to the new server will be invisible to you.

To make it easier for our members to reach VTS servers other than our main server, we have established some easy-to-remember sub-domain names. We will establish others as the need arises. The currently existing sub-domains are the following:

propagation.vtsociety.org
Propagation committee web site
transactions.vtsociety.org
Transactions on VT web site

E-Mail

Sometimes you don't know which VTS volunteer is the right person to help you with a problem. To make it easier for you to find the VTS volunteer you need to help you, we have established e-mail addresses based upon job title. When the individual holding a particular position changes, the forwarding will be changed, so that the e-mail address follows the position, not the individual. Below is a table of VTS e-mail addresses:

pres@vtsociety.org	President
xvp@vtsociety.org	Executive Vice President
vpLandTrans@vtsociety.org	Vice-President for Land Transportation
vpMobileComm@vtsociety.org	Vice-President for Mobile Communications
vpMotorVeh@vtsociety.org	Vice-President for Motor Vehicles
pastpres@vtsociety.org	Junior Past President
secy@vtsociety.org	Secretary
treas@vtsociety.org	Treasurer
awards@vtsociety.org	Awards Chairman
chapters@vtsociety.org	Chapters Coordinator
conf@vtsociety.org	Conference Coordinator
newMem@vtsociety.org	New Member Liaison
news@vtsociety.org	VTS News Editor
propagation@vtsociety.org	Propagation Committee Chairman
siteSel@vtsociety.org	Conference Site Selection
stds@vtsociety.org	Standards
transactions@vtsociety.org	Transactions Chief Editor
webmaster@vtsociety.org	Webmaster

Call for Papers

VTC2001-Fall

Arthur Greenberg, Chairman, VTC-01/Fall

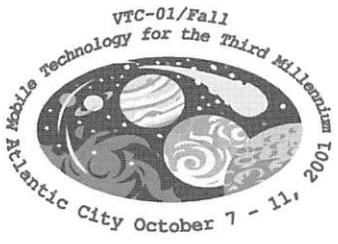
These are exciting times in the field of mobile communications and transportation systems. New techniques and new advances in components have combined to open the doors of our technology. New and advanced applications are becoming an everyday occurrence. And the market for mobile communications is growing at an astounding rate.

The growth of knowledge that accompanies our expanding field must be disseminated to the members of the field and that is the purpose of the semiannual Vehicular Technology conferences. The 2001 Fall conference will continue the tradition of presenting the latest developments in the technical areas that are germane to mobile communications. To enhance the conference we will be introducing a one day workshop of "hot" topics to supplement the normal four days of papers and tutorials.

The location of VTC-01/Fall will be Atlantic City, NJ. Atlantic City has long been known as a seaside resort with excellent facilities for the entire family, and it is located about one hour from Philadelphia. It is convenient, by car or train, to a large percentage of the IEEE membership and air transportation is available from anywhere in the world, via Atlantic City and Philadelphia International airports.

The VTC-01/Fall committee hopes to make this an enjoyable and rewarding conference and we hope to see you.

A full Call for Papers appears overleaf.



"Connecting the Mobile World"

CALL FOR PAPERS
The IEEE Semiannual
Vehicular Technology
VTC-2001/Fall Conference
October 7-11, 2001
Atlantic City Sheraton Conference Hotel
Atlantic City, NJ

IEEE
NETWORKING
THE WORLD

VTC-2001/Fall will be held in Atlantic City, New Jersey. The goal of the conference is to provide quality coverage of technical innovation and applications of vehicular and mobile systems. Over 400 full technical papers and posters will be presented, along with tutorials and exhibits. The program committee invites your participation in the conference, including papers and tutorials in the following areas

- Antennas and Propagation (01): Smart antennas, space-time processing, channel modeling, prediction tools.
- Wireless Access (02): Multiple Access Technology, spread spectrum technology, OFDM Technology, Access Protocols, Channel Assignment
- Transmission Technology (03): Modulation/demodulation, Source/channel coding, interference rejection, equalization and synchronization, multi-user detection, Software radio, Receiver and transmitter design.
- Multimedia, Networks and Systems (04): Mobile multimedia technology, mobile data/computing/ navigation networks, wireless ATM
- Wireless Personal Communication Systems (05): IMT-2000, broadband mobile communication systems, cellular technology, location techniques
- Mobile Satellite (06): Mobile satellite communications, LEO/MEO/GEO networks, navigation
- Transportation (07): Intelligent transportation/vehicle systems, vehicular electronics

Submission of Abstract

Authors should submit an extended abstract up to 2 pages. Forms for submission are soft copy in MS Word, PDF or PS. The submission must include the name, complete return address, telephone and FAX numbers, the designation number of the Technical Subject Areas of the paper, and the email address of the author(s). Submissions should be submitted to the website
`http:\\www.fallvtc2001.org`

Important Dates

Feb 28, 2001	last date for submission of abstracts
May 15, 2001	notification of acceptance
July 15, 2001	last date for submission of full paper

General Chair
Arthur H. Greenberg
Lucent Technologies
Email: `a.h.greenberg@ieee.org`

Technical Program Chair
Jack H. Winters
ATT Research
`jhw@research.att.com`

Conferences of Interest

The following table shows VT-06 sponsored and co-sponsored conferences as well as related conferences not sponsored by the Society. While every attempt was made to ensure accuracy, you should contact the respective conference committee to confirm date and location.

DATE	CONFERENCE	LOCATION	WEB PAGE	
6-8 November 2000	APWC '00	Waltham, MA	http://www.eece.unm.edu/apwc2000	
6-9 November 2000	7th World Congress on ITS	Turin, Italy	http://www.torino2000.itscongress.org	
12-15 November 2000	WPMC-2000	Bangkok, Thailand	http://www.tc.ait.ac.th/wpmc.htm	
19-23 November 2000	ICCS 2000 7th IEEE Singapore Int Conf on Communications	Singapore, Singapore	http://iccs.cwc.nus.edu.sg/	
22-25 November 2000	5th CDMA International Conference CIC 2000	Seoul, Korea	http://cic.etri.re.kr	
27 November – 1 December 2000	Globecom 2000	San Francisco, CA	http://delson.org/si/gc00/	
29-30 November 2000	Multiradio Multimedia Comms MMC 2000	Berlin, Germany	http://www.comnets.rwth-aachen.de/~drive	
3-6 December 2000	MMT 2000	Duck Key, FL	mailto:stuber@ee.gatech.edu	
17-20 December 2000	ICPWC '00	Hyderbad, India	http://www.citr.ece.uvic.ca/icpwc2000	
20-22 February 2001	EPMCC 2001	Vienna, Austria	http://www.epmcc.com	
17-19 April 2001	Joint Rail Conference	Toronto, Canada		
6-9 May 2001	VTC 2001-Spring,	Tel Aviv, Israel	http://www.congress.co.il/ieee_new/	
6-8 June 2001	3Gwireless 2001	San Francisco, CA	http://delson.org/3gwireless01	✓
11-15 June 2001	ICC2001	Helsinki, Finland	http://www.icc2001.com	✓
8-13 July 2001	APS International Symposium / URSI Radio Science Meeting	Boston, MA	http://www.ieeeaps.org/2001APSURSI/	
9-12 September 2001	WPMC'01	Aalborg, Denmark	http://www.wpmc01.org	✓
30 September – 3 October 2001	PIMRC 2001	San Diego, CA	http://www.pimrc2001.org	✓
7-11 October 2001	VTC 2001-Fall	Atlantic City, NJ	http://www.fallvtc2001.org	✓
28-31 October 2001	MILCOM 2001	Washington, DC		
25-29 November 2001	Globecom 2001	San Antonio, TX	mailto:g.weisman@comsoc.org/	
Spring 2002	VTC 2002-Spring	Birmingham, AL	mailto:jacksonP2@bek.com	
16-21 June 2002	APS International Symposium / URSI Radio Science Meeting	San Antonio, TX	http://www.ieeeaps.org/2002APSURSI/	
24-28 September 2002	VTC 2002-Fall	Vancouver, BC	mailto: bhargava@engr.UVic.CA	
Spring 2003	VTC 2003-Spring	Seoul, Korea	mailto:m.lewis@ieee.org	

Conferences marked '✓' have open calls for papers as of 30 November 2000. This list is based upon the conference calendar at our web site, which is updated more frequently than this list can be. To access it go to the following URL: *http://www.vtsociety.org/*, then click on "Conference List" in the left frame.

Corrections and additions to this list are most welcome. We are particularly interested in adding listings for Automotive and Transportation conferences. Please send corrections and additions to Tom Rubinstein at t.rubinstein@ieee.org.