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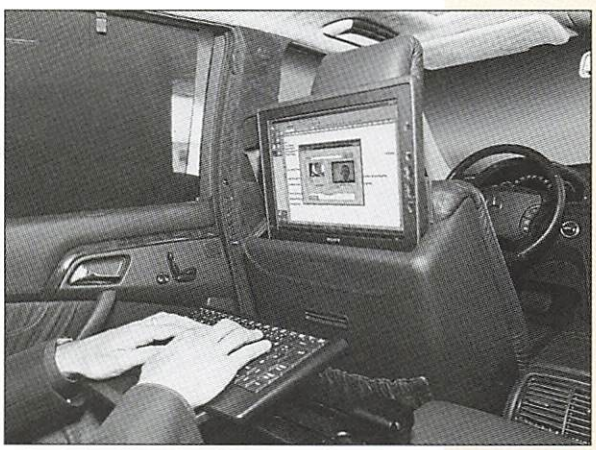

PHOTO DAIMLERCHRYSLER

DaimlerChrysler, Siemens, Sun, T-Mobile, Jentro and MBDS jointly present the first car with integrated UMTS services. Bill Fleming considers the prospect for such telematics in his column.

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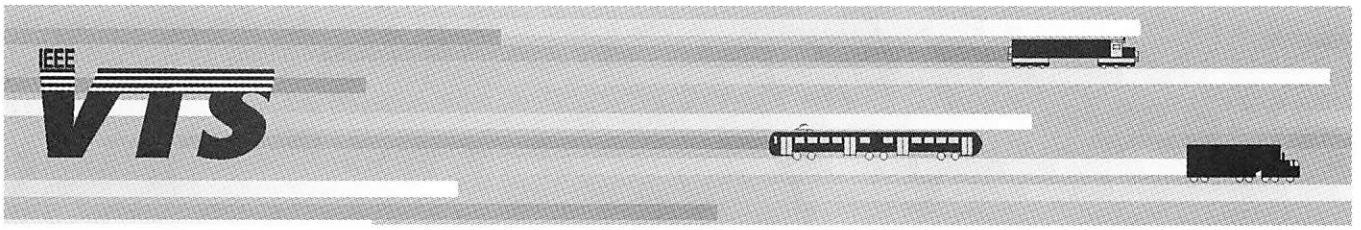

Foreword

James Irvine, Editor

I was travelling by train last week and we were delayed by a track circuit failure, meaning that trains had to be sent forward under caution. Being the West Coast Main Line, delays soon built up, and the carriage I was in was filled with mobile phone calls. What was interesting was that these were not short 'I'll be late' messages, but long 'I'm stuck on the train and I want to pass the time' calls. On the return, my neighbour spent the entire time on a series of calls to various friends – no mean feat at 110mph.

People like to communicate, and as Richard Frenkiel said in his article in the last issue, sometime in the last decade the mobile phone became ordinary. Not only do more people have them, but they are using them for longer. One of my travelling companions carried two phones, arguing that the cheaper one's 95% coverage was not sufficient to ensure she always remained in touch.

I have a confession to make. Although I work in the industry, I don't have a mobile phone, on the basis that freedom from communication is as important as freedom to communicate. My cohort of friends use more traditional means of communication, and for work, it can be very relaxing being incommunicado; assuming, of course, that one has faith in one's colleagues. However, this happy arrangement is under threat. Where once colleagues were simply perplexed that I did not have a cell phone, they are now demanding that I have one, as it is unreasonable that I cannot be contacted in an 'emergency'. While my family has that right, I have difficulty contemplating business situations where that would apply.

I am not entirely alone. Most long distance railway companies in the UK now have 'quiet coaches', where mobile phones are banned. One company converted their smoking carriages into this accommodation – one social outcast to another?

So what has all this to do with VTS? Well, a casual visitor to VTC in Birmingham may have gathered the impression that no-one was using mobile phones, for all the gloom which pervades the industry. As described in our report on VTC, Ed Salley summed up the situation well. The stock market is worried about 3G and the extent to which people will want new data services. With stock prices falling and redundancies being announced, it is all too easy to forget the fundamentals. For mobile, this means voice and messaging, which may be less exciting than new services but have a strong, and growing, customer base. As markets mature, competition will increase to drive down unit costs, but increasing customer familiarity with the product will increase usage. In the UK, the average customer spend per mobile phone remains are about $30 in spite of regulatory pressure on unit prices, and revenue of the major operators from their 2G services is growing. Few countries have reached penetration levels of above 70% where user growth starts to slow. As Abu Dafalla discusses overleaf, there are many countries with strong growth potential.

Much has been made of the fact that in 2001, mobile phone sales fell by 3%, but look at the detail, and you will see subscribers grew by 255 million, compared to 250 million in 2000. With 25% growth, how gloomy should we be?

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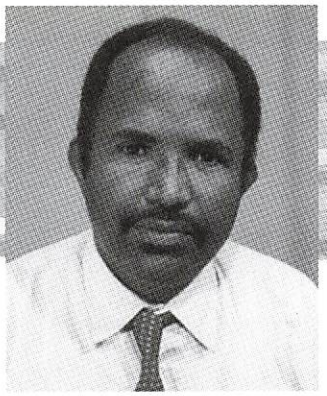

The African Mobile Cellular Telecommunications Sector

Abu S.E. Dafalla, COMESA

The Africa cellular communications market shows high growth rate and is attracting a lot of investment. This is due to the low density in the fixed telephony and the long waiting lists for telecommunications services – cellular systems deployment is quick and fast. Prepaid cellular services also attract many users. This paper analyses the cellular market, mobile satellite communications, data application, regulatory matters, and 3G technology in the African market.

Introduction

Africa has the lowest tele-density for fixed telephones of all the continents. It averaged a tele-density of 2.48% for the year 2000, which compares to the average for the Americas, Asia and Europe at 35.18%, 9.55% and 39.43% respectively. The tele-density for Sub-Saharan Africa is only 0.75% [1].

Privatisation of the incumbent operator has been concluded in many countries, and going on in the remaining ones. The process of establishing independent regulatory authorities is continuing in many African countries [2]. There is a lack of telecommunications regulation and rules. This is due to the lack of skilled manpower, as skilled personnel are attracted by the private sector entities.

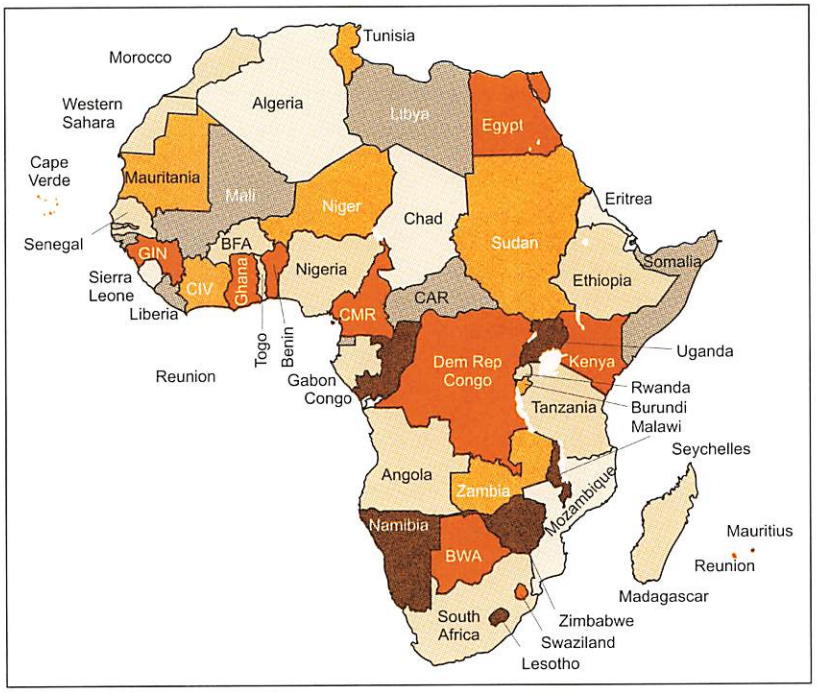

Figure The African Continent (not all countries shown, see Table 1 for abbreviations)

Africa shows great need for cross border routes, which connect neighbouring countries. However, national networks in some countries are not fully digital. There are some projects going on to link Africa to Africa [3]. These projects will put Africa on the edge of information and communications technology which will have direct and indirect impact on the socio-economic development. Africa has great opportunity of investment in telecommunications sector. Many countries have attracted private sector investment either in cellular communications, Internet or investing in the incumbent operators. However, Africa still has the lowest level of investment from the private sector when compared to the other continents [4].

Mobile services are developing very rapidly through out the continent, as mobile services are provided by private companies. Mobile therefore gives an opportunity to investors to participate in the telecommunication networks development. A number of strategic investors are involved, such as Telecel International, MSI, Vodacom, and Telekom Malaysia.

The Mobile Communications Market

Cellular services are growing quickly all over the world and in Africa as well, as can be seen from Figure 1. However, Africa still has the lowest average cellular telephone density among the continents with a figure of 1.98 for the year 2000. Cellular is the fastest growing telecommunications sector compared to fixed telephone and information technology (see Figures 2-5). In the year 1998, there are five countries which had a cellular density of at least one percent. This number increased to eleven in 1999 and to seventeen in 2000. The number of the countries which achieved a fixed telephone tele-density of at least one was 23, 24 and 27 for the years 1998, 1999 and 2000 [1].

The rate of growth for cellular was 119.6% between the years 1998 and 1999, Figure 6, which is greater than that of Internet users at 59.6%, and of fixed telephone subscribers, which is 8.5% for the same period. It can be seen that the growth rate for the cellular is very high, while the growth rate for the fixed telephone is the lowest. The forecast for the years 2001 to 2005 shows that the cellular sustain the high growth rate (see Figures 2-5). According to the forecast, the average cellular mobile users per 100 inhabitants will exceed the one for the fixed telephone users in the year 2002.

Country	Number of Operators	Capacity year 2000 (000)	Compound Annual Growth Rate 1995-2000	Type of Systems	Competition Status
Benin (BEN)	4	55.5	121.1	AMPS	Full competition
Botswana (BWA)	2	200	-	GSM	Full competition
Burundi	3	16.3	96	AMPS	Full competition
Burkina Faso (BFA)	3	25	-	GSM	Full competition
Cameroon (CMR)	2	148	121.1	GSM	Full competition
Cape Verde	1	19.7	-	-	No competition
Cent. African Rep. (CAR)	3	5	157.4	AMPS	Full competition
Congo (COG)	3	70	2.38	D-AMPS	Full competition
Cote d'Ivoire (CIV)	3	450	-	GSM	Full competition
DR Congo	4	*10*	5.6	AMPS	Full competition
Egypt	3	1359.9	183.9	TACS/GSM	Full competition
Ethiopia	1	17.8	-	-	No competition
Gabon	4	120	97.4	AMPS	Full competition
Ghana (GHA)	4	130	83.8	TACS, AMPS, GSM	Full competition
Guinea	3	42.1	113.5	AMPS, GSM,	Full competition
Kenya	2	127.4	123.6	TACS/ GSM	Full competition
Lesotho	1	21.6	-	GSM	No competition
Madagascar	4	63.1	117.4	AMPS, GSM	Full competition
Malawi	2	49	164	GSM	Full competition
Mauritius	2	180	72.8	TACS, GSM	Full competition
Morocco	2	2342	139.8	NMT/GSM	Full competition
Namibia	1	82	87.9	GSM	No competition
Nigeria	3	30	18.2	TACS,AMPS,GSM	Full competition
Reunion	1	276.1	118.8	AMPS/GSM	No competition
Senegal	1	250.3	359.6	AMPS/GSM	No competition
Seychelles	2	26	249.2	GSM	Full competition
South Africa	3	8308	73.1	GSM	Full competition
Sudan	1	23	-	GSM	Intend to full competition
Swaziland	1	33	-	-	No competition
Tanzania	5	180.2	120	GSM	Full competition
Togo	2	50	-	GSM	Full competition
Uganda	3	188.6	155.1	GSM	Full competition
Zambia	3	98.9	129.7	GSM	Full competition
Zimbabwe	4	309	-	GSM	Full competition

Table I: Overview of cellular telecommunications [1,2,4]

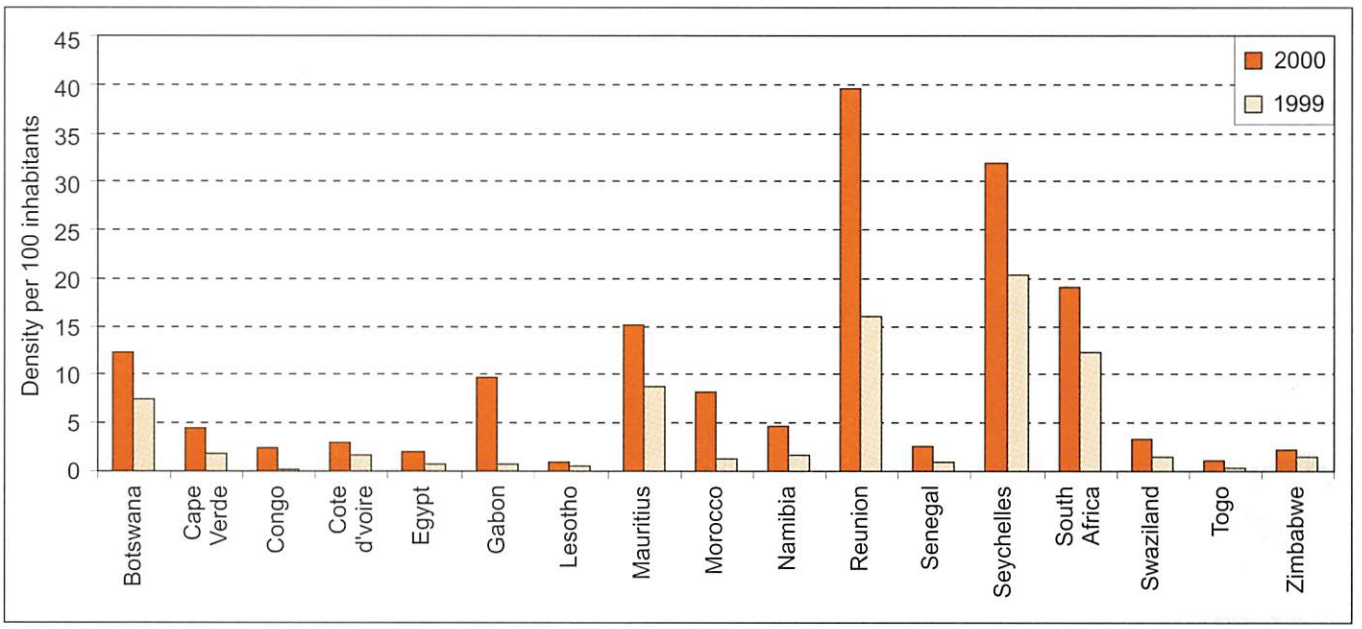

Figure 1 Cellular Density in Selected African Countries

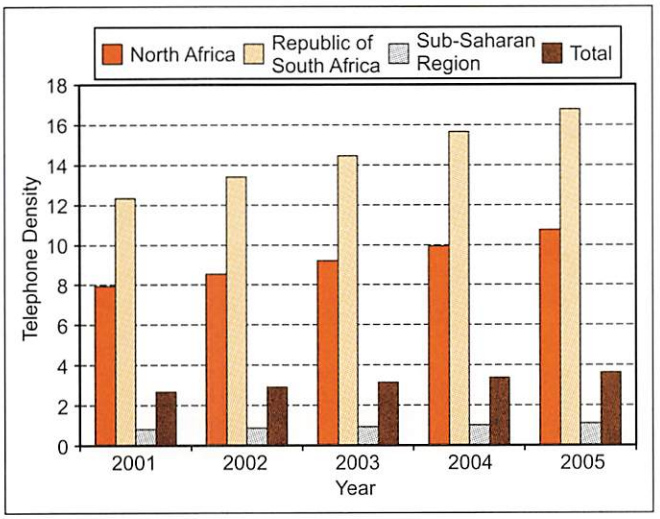

Figure 2 Fixed Telephone Lines Density Forecast [1]

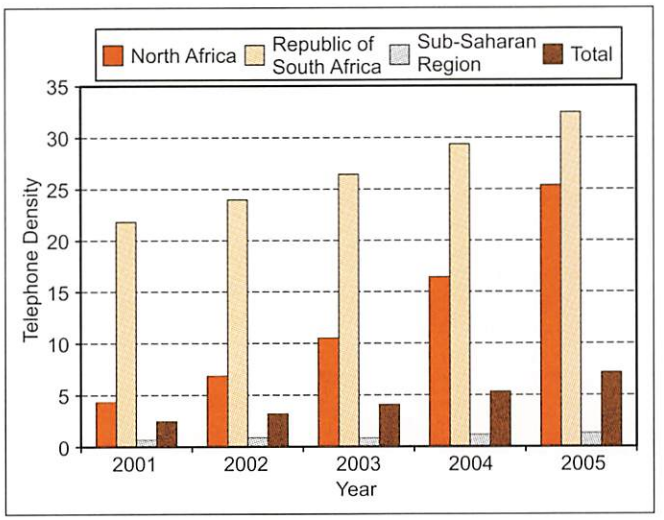

Figure 3 Mobile Cellular Subscribers Density Forecast [1]

In Africa, there is still an opportunity to invest in cellular mobile communications, since there are countries with high potential for investment which have very low growth rates. Nigeria has a Compound Annual Growth Rate (CAGR) of 18.2% for the year 2000 (Table 1). Nigeria is expected to witness a huge development in cellular mobile communications due to the high population and the lowest telephone density in the world. The other countries are D. R. of Congo, Ethiopia, Libya, Mozambique, and Sudan.

Mobile Satellite Communications

There are many Mobile Satellite Operators (MSO) such as Iridium, Globalstar, ICO Global Communications, Teledesic, Odyssey, and Thuraya. The systems provide dual service enables customers to use GSM services at any time in local networks, yet automatically switch on to satellite mode whenever out of local terrestrial reach [5,6].

These services will be particularly necessary in Africa. The operators are targeting subscribers in Africa willing to pay high premium for connectivity worldwide, for example, the mining and oil exploration industries which need access to advanced data and network facilities. The MSO can deliver services to African rural areas, especially as payphone, such as is done in Morocco. The high tariff will be one of the barriers which will reduce its penetration in rural areas, but the MSO assure that their services will be more cost effective than other technologies in rural areas. The other expected barrier in Africa is a regulatory one. The case of Globalstar in South Africa is a good example of this barrier. Most of the African countries would like to control the flow of the information in the country [6].

The Globalstar, Iridium, and Thuraya companies are operating in Egypt. Globastar is operating in Morocco and very soon in Algeria and South Africa where it has a gateway which has been built several years ago waiting for regulatory approval. Through the gateway in South Africa, Globastar will cover Botswana, Mozambique, Namibia, Lesetho, and Swaziland. Thuraya operates in Egypt and Sudan. Its services cover north and central Africa.

Regulatory Matters

The telecommunication sector in Africa is liberalised and privatised in most of the countries, especially with regard to cellular and data communications. Most of the African countries have formed independent regulatory authorities. Figure 7 gives the percentages of countries which formed telecommunications regulatory entities in the region in comparison to other regions in the world. 67% of African countries have regulatory bodies compared to 74% in the Americas, 69% in Europe, 43% in the Arab region and 34% in Asia-Pacific (see Figure 7) [7]. However, in some countries, the regulatory authorities need to build up their capacities so as to

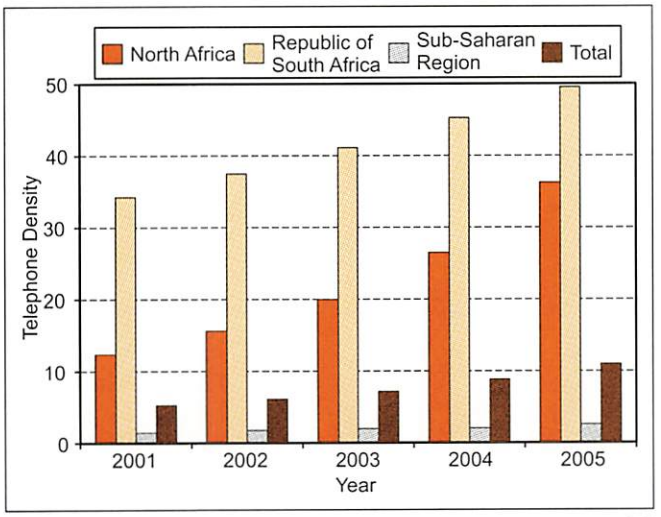

Figure 4 Total (Fixed & Mobile) Lines Density Forecast [1]

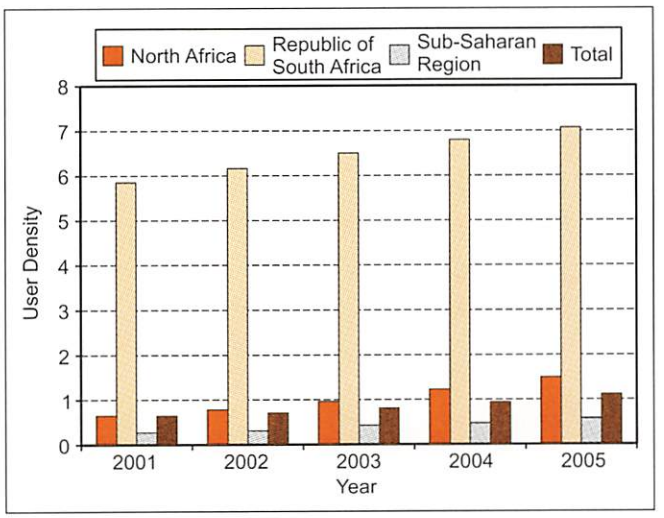

Figure 5 Internet Users Density Forecast [1]

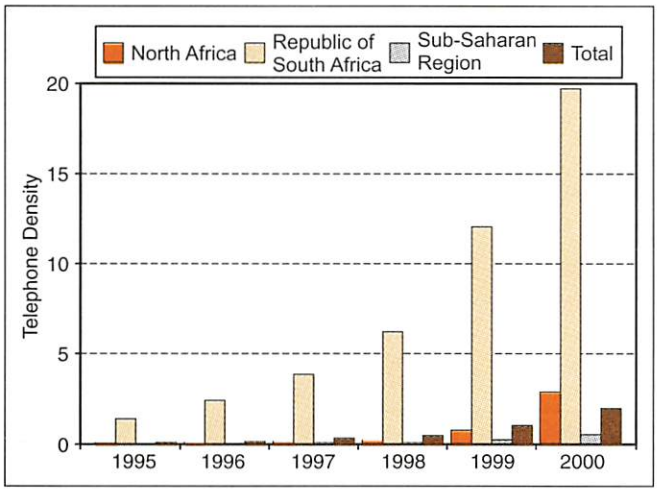

Figure 6 Mobile Subscriber Growth (Density/100 inhabitants) over the past 5 years)

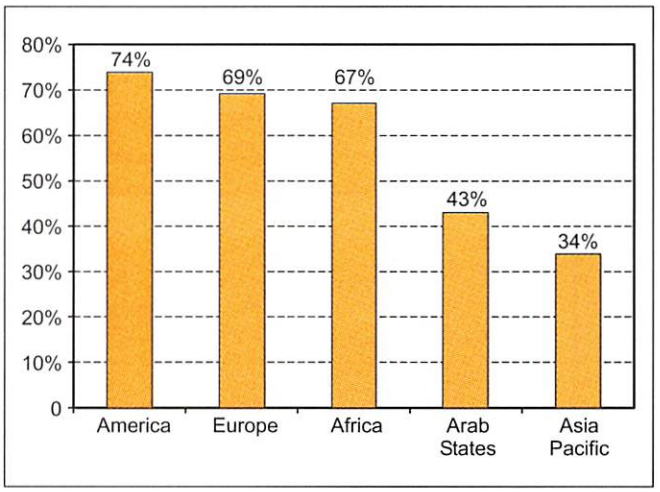

Figure 7 Incidence of Separate Regulators by Region (December 2001)

attend to all regulatory issues which rise up with liberalisation, such as anti-competitive practice [2, 4].

Cellular communications has taken up most of the telecommunications investment in Africa. This is due to the easy installation of networks and full competition and privatisation of the sector. The competition in cellular sub-sector is measured as the percentage of countries having more than one cellular operator. Figure 8 gives a comparison of the percentages of countries allowed competition among the various world regions. Competition in Africa is better than in the Arab States and Asia-Pacific and is competitive with the Americas (see Figure 8). In Tanzania there are five cellular operators licensed (see Table 1). Four Cellular operators are licensed in each of six African countries. While there are some countries with only one cellular operator, the market is expected to open up very soon. Therefore, the cellular communications is under full competition in most African countries, as can be seen from Table 1.

The interconnection requirement is one of the constraints which is slowing down development in this sector. In most cases, the rate for mobile services is higher than that of the public switched network. As a result, mobile subscribers are more called by fixed subscribers than they call them. This drives the fixed operator to consider this particular traffic as an exceptional source of income. When they have to negotiate an interconnection rate, each party refers to a normal rate applied for a local call by the other. The mobile operator tends to reduce the final rate to be paid by the subscriber, while the fixed operator is inclined to increase the amount to be received at the end. The fixed operator tends to ignore that as the deployment of mobile services is easy and rapid, it could be possible to reduce cost of mobile services to a level comparable to, or lower than, those of fixed lines.

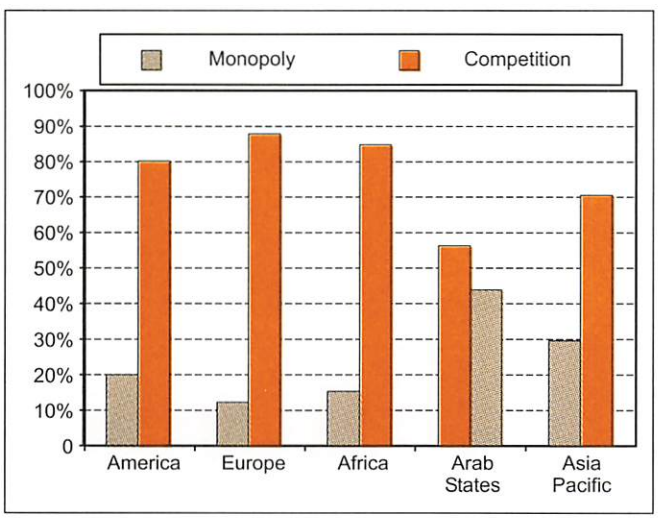

Figure 8 Competition in Mobile Cellular Services

Data Application

Deregulation will spur the growth of innovative strategies in the mobile market, opening up new business opportunities. There will be a greater uptake of Wireless Application Protocol (WAP) services as a result of increased speed of data throughput, making the usage of the applications faster and easier. WAP is available to African customers especially in Egypt, Morocco, and South Africa [8,9]. New networks are being rolled out that will allow for mobile data services. WAP is criticised for low speed, poor implementation and delivery of just three to four lines of text. Poor implementation can also result in errors due to the usage of WAP's language (Wireless Markup Language, (WML) in programming a phone. However, commerce can be carried out safely via WAP.

WAP provides email and information for news, financial, sport results, services. Short Message Service (SMS) is equivalent to a telex of two and one half lines. SMS is the most popular cellular data service. It has direct impact on paging which many consider it as an obsolete technology. The majority of the users in Egypt, Morocco and South Africa are able to use SMS services.

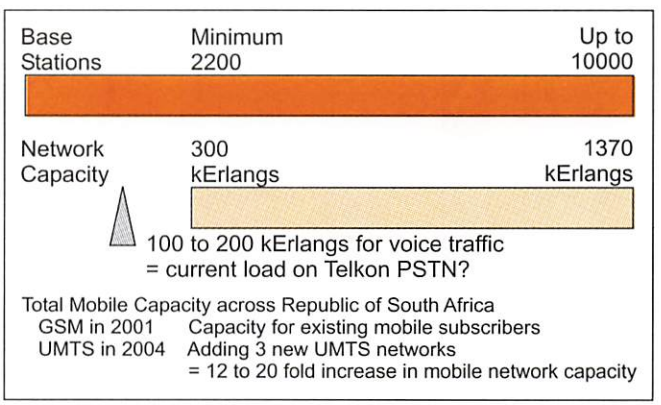

Figure 9 Nokia UMTS Capacity Projections [10]

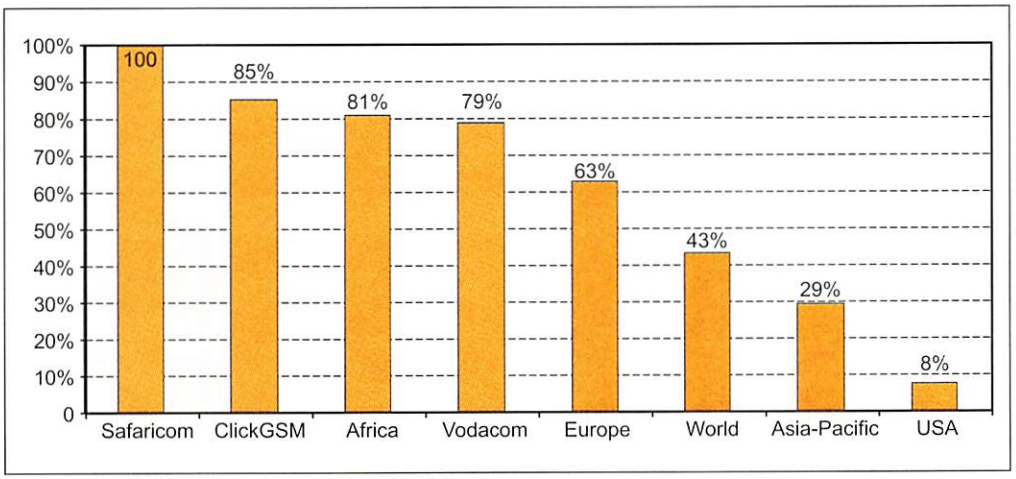

Figure 10 Proportion of Pre-paid Customers, selected regions and operators, 2000 [2]

3G Technology

Internet users are increasing everyday world wide. In Africa, the growth rate of Internet users is higher than the one for fixed telephony. Cellular operators are offering wireless data services. This will stimulate the demand for high bandwidth services. High speed wireless services – streaming audio and video, two-way video phone, fax and file transfer, messaging, e-business and e-commerce – can be provided via General Packet Radio Service (GPRS), E-GPRS and Universal Mobile Telecommunications System (UMTS). However, UMTS is the most suitable technology for multimedia, broadband information, voice, and data transmission [9,11].

UMTS licenses can be awarded on the basis of auctioning or beauty contest. The license auction allows the government to raise revenue, but high license fees would lead to high service charges. In addition, the auction process will not be feasible if the demand for licenses is less than the number of license being auctioned.

The licensing process for the provision of the 3rd generation networks has been underway for some time worldwide. The Republic of South Africa's Department of Communications intends to initiate its own 3G consultations process. It appears that South Africa government may issue the bid on the process of the 3G licence later this year or next year. Last year, the South African Government issued a third GSM licence to the C Cell company.

Nokia provided the following UMTS cost estimates in a Next Generation Networks (NGN) presentation to Telkom South Africa [10]. UMTS will require a major investment from operators. The cost of a UMTS licence is projected to range from US$ 400 to US$ 1000 per subscriber. The rollout cost per subscriber is estimated for US$ 100-200. The revenue per subscriber will have to be raised from US$ 200-400 to US$ 500-1000 annually. This projection will ensure UMTS network viability and profitability. Nokia made the prediction regarding the capacity of a UMTS network in South Africa, shown in Figure 9. The initial capacity of the system is 300 kilo erlang. The UMTS network would require 2200 base stations to handle the traffic. As the number of customers grows and the traffic erlang figure grows to 1370 kilo erlang, more base stations have to be installed up to 10000. The mobile capacity across South Africa for 2001, plus the projection for UMTS capacity in 2004 represents the total mobile capacity in the country.

One of the cellular operators in Egypt intends to implement GPRS which is the 2.5G. The Democratic Republic of Congo delegation which participated in the regional workshop on sector reform for countries in special need stated that his country is studying the implementation of the 3G.

Tanzania has placed obligations on its new strategic investor. One of these obligations is the total replacement of legacy PSTN infrastructure and migration towards the next generation networks at the end of the exclusivity period which is year 2005 [12]. Tanzania is studying the implementation of a 3G including licensing procedure [12].

This analysis does not mean that African countries will go for UMTS and leave out other similar third generation mobile systems that are members of the ITU International Mobile Telecommunications, IMT 2000 family of mobile standards. Most African countries are not yet ready to decide on the type of the 3G technology and the procedure of offering licenses.

Tariffs and Revenue

Mobile networks are quick to install which clears out the waiting list for mobile services. Pre-paid mobile cards increase the number of cellular customers in areas where in-

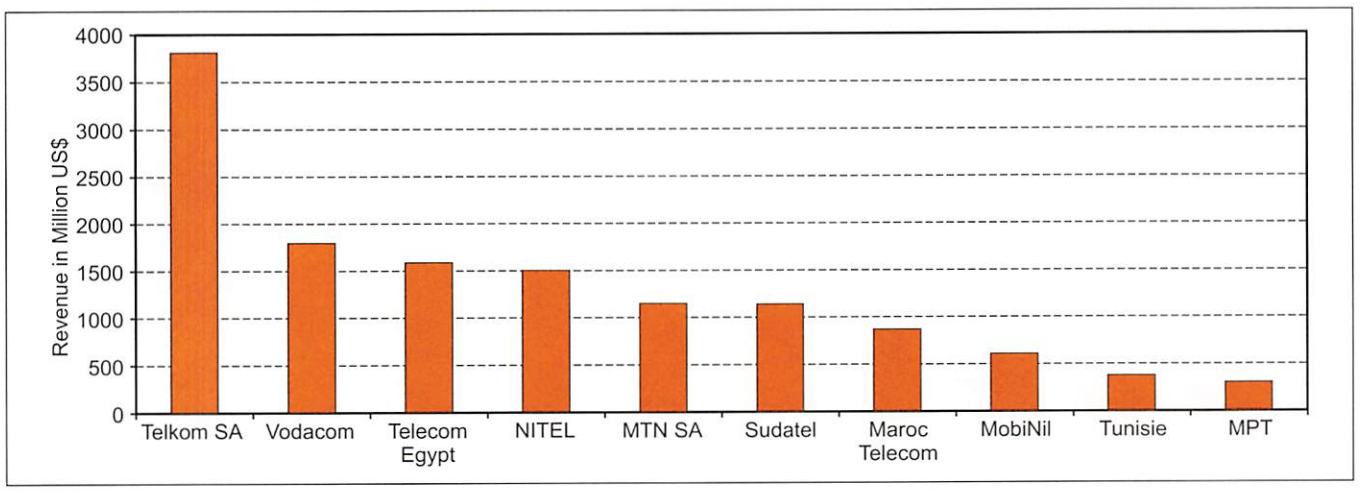

Figure 11 Top Ten African Telecom Operators ranked by Revenue, 2000

come is low and the cash up-front is generally the preferred means of payments. Pre-paid reduces operator risk due to bad credit and allows many who would not normally qualify for a post-paid service to have mobile service. In Africa four out of every five cellular customers use pre-paid (see Figure 10). The companies in Figure10 are Safaricom from Kenya, ClickGSM from Egypt and Vodacom from South Africa. In Morocco, a pre-paid package including a handset costs US$ 36 which is around 2.6% of the average income. Morocco covers 95% of its population by a mobile signal, which means that the country has achieved universal telecom access.

The connection fees is very high in Algeria, Djibouti, Sudan and Central African Republic in the range of US$ 586-225, while the countries which have a lower connection fees are Malawi, Swaziland, South Africa and Zimbabwe in the range of US$ 114-9, according to 2000 data [2]. The lowest connection fees in Africa is US$ 9 [2] which is in Zimbabwe. The monthly subscription is equal to or less than US$ 26 in most of African countries. The charge for 3 minute local call is more than US$ 1 in some countries and in the other ones is less than US$ 1, according to 2000 data [2]. For international traffic, the incumbent operator gives a discount to the cellular operator, but some cellular operators share the discount with their subscribers [2].

Africa has the highest revenue per line worldwide [4]. This factor will attract investors among other factors. For the year 2000, the top ten telecom operators in Africa ranked by the revenue are Telkom SA, Vodacom and MTN from South Africa, Telecom Egypt and MobiNil from Egypt, NITEL from Nigeria, SUDATEL from Sudan, Maroc Telecom from Morocco, Tunisie from Tuisia and MPT from Algeria (see Figure 11). Three operators from the top ten are cellular operators which are Vodacom, MTN, and MobiNil. This means that cellular operators are not only competing to have more subscribers with fixed operators but also to have high revenue [2].

Conclusions

It is quite clear from this analysis that Africa still has great opportunity for investment in the telecommunications sector generally, and especially in cellular communications. There is work to be done to attract investment, and regulatory barriers have to be removed, especially in respect of issues related to inter-connection among the operators and giving way for the new technologies. MSO will add a lot to Africa telecommunications development especially when their tariff is affordable to Africans, who has the lowest income in the world.

Africa needs to study the implementation of 3G. The countries need to determine the type of the system, procedure of issuing the licence and securing investment for building the network.

References

1. ITU/BDT/ICT indicators, ITU, 2001.
2. African Telecommunications Indicators 2001, Nov. 2001, ITU.
3. ITU/BDT "An Invitation to the Digital Challenge", 2001.
4. African Telecommunications Indicators, ITU, 1998.
5. Jilani Zeribi, "The potential of Mobile Satellite Services in Africa". Africa Telecom 98, 4-5 May, 1998, Johannesburg, South Africa.
6. "Globalstar prepares for take off", Peter Bacon, Communications Africa (Interview), June/July 2001.
7. Asenath Mpatwa " Regulatory Trends and Status on the African Continent", Presented at the regional workshop on sector reform for countries in special need, organised by ITU and USAID, Nairobi, Kenya on 28 Jan. – 1 Feb. 2002.
8. Osman Sultan, "WAP next for Egypt", Communications Africa (Interview), Feb./March 2000.
9. Joseph E. Wilkes, "Gearing up for 3G", Communications Africa, August/ September 2001.
10. Harald Ruck & Naomi Mansvelt, "Technology Awareness Document", Integrated Technology and Application Strategy Division (ITAS), Telkom SA, South Africa.
11. Michael Stocks, "3G technology possible for Africa", Communications Africa April/May 2000.
12. John A. Mpapalika "Tanzania country experience: strategies for achieving policy objectives", Presented at the regional workshop on sector reform for countries in special need, organised by ITU and USAID, Nairobi, Kenya on 28 Jan. – 1 Feb. 2002.

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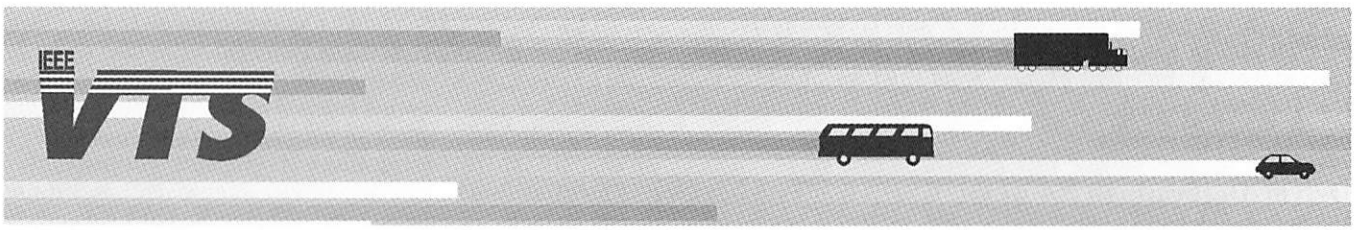

Real-Time Traffic Information for Dynamic Route Guidance

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The phrase "Dynamic Route Guidance" has different meanings to different people. This paper discusses various functionalities that can be classified as Traffic- Dependent Route Guidance, their advantages and disadvantages to travelers, their benefits and risks to product providers, their real-time information requirements, and the availability and / or unavailability of such real-time information now and in the future. The paper also discusses the need to evaluate various Dynamic Route Guidance functionalities under actual driving conditions by a variety of drivers in order to understand driver needs and preferences, and in order to assess product risks and liabilities.

Introduction

Route-guidance systems provide instructions to drivers about how to drive from a specific origin to a specific destination. These instructions are generally produced at the beginning of the trip based on estimates of the fastest, shortest, or easiest route, depending on driver preferences. The complete set of route-guidance instructions for a particular trip can be provided to the driver before the trip begins, or route instructions may be presented on a turn-by-turn basis as the trip proceeds in response to driver requests, or automatically based on vehicle progress. Route-guidance systems may be implemented as nearly autonomous on-board vehicle navigation systems, or as communications-based off-board systems. Off-board systems can provide information to drivers by voice through ordinary cellular telephones, or by text or graphical displays through simple digital communications and display systems. The displays themselves can be devices that are imbedded in vehicles (such as emergency roadside assistance call-center interfaces), or portable devices that are carried by drivers both in and out of vehicles (such as hand-held PCs [HPCs] or PCS telephones).

Dynamic Route-Guidance (DRG) systems permit routes to be revised while drivers are in route under circumstances where drivers depart from the prescribed route (by choice or inadvertently), or where traffic conditions change so that an alternate route is better. Of course, for traffic-dependent route guidance, even autonomous navigation systems must receive traffic information by some wireless communications means.

Traffic-Dependent Route Guidance

A variety of functionalities can be classified as traffic-dependent route guidance. These functionalities can be divided into three broad classes: (1) driver-determined routes, (2) predefined alternative routes, and (3) computer-selected routes.

No universal "best choice" exists among these functionalities. The preferred approach will depend upon the driver, the driving circumstances, and the type of information interface available to the driver. These functionalities and preferences are discussed in more detail below.

Driver-Determined Routes

In this case, drivers are presented with real-time traffic information and are left to determine their own routes from origins to destinations. Real-time information is perhaps best presented through in-vehicle display screens or HPCs that show traffic problems as icons on maps. Lists of congestion and incident reports for the travel regions of interest to drivers also can be presented on text displays or through text-to-speech interfaces. Such presentations may be more difficult to assimilate than map displays since drivers must mentally pick out the information of relevance to themselves from other irrelevant information. That filtering process is easier for many people when they see icons that are characteristic of various types of incidents and congestion presented on map displays.

Many readers may not consider this driver-determined routing approach to be traffic-dependent route guidance since drivers, and not computers or advisors, are determining the routes and providing the route guidance. In this case the driver is serving as both a computer and an expert system. However, it is still an important case to consider, because it will probably be the preferred method of using real-time traffic information for a substantial portion of drivers in the United States, and probably elsewhere.

On the order of 98% of driving is done on familiar roads in drivers' home towns. Drivers normally know where they are, and they know a wide variety of routes to get to their destinations. In fact, they probably often know routes that they prefer over routes provided by computer pathfinding and route-guidance systems. They know what traffic lights to avoid because of very long cycle times. They know that they can cut through the shopping center parking lot to avoid congestion from the industrial park. What they need to know are the locations of accidents, road construction, congestion, fires, police actions, sporting events, and so forth, that produce unexpected and significant delays. Given such information, local drivers can decide (probably better than computers) what their best route alternatives are.

This traffic-dependent routing approach is easy to implement and low risk from the product or service providers viewpoint because, assuming that the real-time information is accurate, customers can only blame bad route choices on themselves and not on the ATIS product or service.

Predefined Alternative Routes

In the predefined-alternative-routes approach, drivers predefine a variety of alternative routes for their planned trips. They enter those routes on their in-vehicle navigation systems, on their HPCs, through their ATIS service providers' Web sites, etc. For example, they might enter their preferred route for going from home to work along with a couple of alternatives. Similarly for work to home. They might also enter their preferred route and alternatives for driving from work to the airport and from the airport to home, etc.

Then, as drivers leave work for home, for example, they check their preferred routes and are presented with only the traffic information that would affect those routes. If their preferred routes have problems, they can check their alternative routes to see if those are any better. They get detailed information on the nature of the traffic problems so they can make their own assessments and decisions as to their best options (which might be to stay at the office for another hour). Once they select a route, they can request updated information on that (or other) routes at any time. In addition, with some systems they can receive real-time alerts of any changes in the traffic situation on their route while in route.

The predefined-alternative-routes approach has a number of attractive features. It keeps drivers in control and responsible for route decisions. It is particularly suitable for simple user interfaces because the information can be easily accessed by drivers using touch-tone phones or speech recognition systems. The traffic information can be presented to drivers on simple text displays, or it can be delivered as speech using text to speech or concatenated speech. Hence, the predefined-alternatives approach can work well with existing cell phones, existing PCS phones, existing connected HPCs, and existing in-vehicle road-side assistance communications devices. The approach could also be integrated into in-vehicle navigation devices.

Computer-Selected Routes

For the computer-selected-routes approach, drivers enter their origins and destinations into on-board navigation computers or via on-board user interfaces to remote navigation computers. The navigation computers use real-time-traffic-dependent pathfinding to estimate the fastest routes from origins to destinations, and they then provide turn-by-turn instructions to guide drivers along the fastest routes. Route guidance may be provided by heading-up moving-map displays, by graphical intersection diagrams showing arrows to indicate turns, by text display, and/or by speech maneuver instructions.

When traffic situations change while drivers are in route, the navigation computers can search for faster routes to the drivers destinations from their current locations. This rerouting feature can be implemented in several ways:

- ✦ Drivers can be alerted about new traffic situations and asked if they want to search for faster routes.
- ✦ The computers can automatically search for faster routes and let the drivers choose from alternative routes.
- ✦ The computers can automatically search for faster routes and reroute drivers on the fastest available routes without the drivers' knowledge.

The automated computer-selected-routes approach seems particularly valuable for drivers in unfamiliar areas who are uncertain of how to get to their destinations, and who have no knowledge about alternative routes. Such automated computer routing should be especially attractive in rental cars.

Potential Pitfalls

A number of potential risks and pitfalls of traffic-dependent route guidance exist, particularly for computer-selected routes. Issues arise in at least four areas: (1) local drivers may prefer their own routes to those from computers, (2) drivers should only be routed on instrumented roads, (3) traffic information is now (and always will be) imperfect, and (4) traffic-dependent routing requires traffic forecasting (which is certain to be imperfect). These issues are discussed in more detail below.

Locals Know Better

As discussed above, locals have knowledge about roads and shortcuts that is unavailable to navigation computers. Furthermore, they may resent bad decisions from computers or from other people, but they will not resent bad decisions of their own. Hence, it is important to provide locals with detailed real-time traffic information so that they can make their own decisions. While locals may consider the recommendations from route-guidance systems, they will probably reject systems that do not enable them to evaluate and follow their own preferred routes.

Alternative Routes must be Instrumented

Traffic-dependent route-guidance systems should never consider or recommend routes that are not instrumented or where the traffic situations are unknown. The dangers of routing drivers from bad situations into much worse situations are too great. In most U.S. metropolitan areas, only some of the freeways are instrumented with speed sensors and cameras. Existing instrumentation is generally inadequate to permit traffic-dependent routing onto expressways, arterials, and local streets. Where incident reporting systems and surveillance aircraft provide adequate confidence about the conditions on alternate routes, then it is reasonable to present those alternatives to drivers.

Traffic Information is Imperfect

Drivers generally understand that traffic information is prone to uncertainties and reporting delays. A serious accident may take 10 minutes or more to detect, validate, and assess as to its likely impact on traffic. Due to the wide proliferation of cellular telephones, problems generally get reported promptly, but 10 minutes or more still may be required for reliable confirmation and assessment. In other instances it may take 15 minutes or longer to learn that traffic has returned to normal after a problem has been cleared. Cellular phone callers seldom call to report that traffic is flowing freely. While increasing numbers of speed sensors and traffic cameras will help, such coverage will primarily be limited to freeways and the extent of coverage will vary greatly among metropolitan areas.

Traffic-Dependent Routing Requires Traffic Forecasting

Many commuters in large metropolitan areas drive 30 to 60 minutes or longer each way traveling to and from work. These long-distance commuters are among the most likely customers for traffic information and trafficdependent-routing products and services. Yet these long commute times present real challenges to route guidance systems and services because the traffic situation can change significantly during the course of the commute – it always can get worse, but it also can get better.

For example, accident-caused delays that are present on their normal routes when commuters begin their trips may be gone by the time they arrive at those accident locations. Unless route-guidance services can forecast such improving traffic conditions, they risk sending drivers on longer alternative routes that will actually increase travel times rather than reduce them.

While it is impossible to predict accidents before they happen, once they do happen it is often possible for traffic reporters, police, and DOTs to forecast the impacts that particular accidents will have on traffic, when the accidents will be cleared, and when traffic will return to normal. Such information is essential to drivers and route-guidance systems when choosing among alternative routes.

Of course any route choice is a gamble because a serious accident which causes unavoidable delays can occur on a route after a driver is already underway and beyond any better alternatives. However, drivers (particularly U.S. drivers) will probably be more accepting of such unpredictable problems when they choose the routes themselves rather than having computers or advisors make the choices for them. In that respect it will probably be desirable (at least to U.S. drivers) for route-guidance systems to show relevant traffic information – along with possible route alternatives – and then to let the drivers decide which routes to take.

Traffic Information Benefits

Traffic-based route guidance can provide at least three major benefits for drivers: (1) reduced travel time, (2) improved safety, and (3) reduced anxiety.

Reduced Travel Time

Reduced travel time is obviously one of the major goals of traffic-dependent routing. However, practical issues should be considered. Considerable variability and uncertainty will always be present in the magnitudes of traffic delays and travel times through various road segments. One reason is that two drivers going through the same stretch of congestion may do so with considerably different travel

times due to different driving styles and depending on which lanes they use. Rerouting drivers to save 5-minutes in travel time is unrealistic and risky because travel times themselves cannot be known to that degree of certainty. Furthermore, as mentioned above, traffic conditions can change substantially during the time required to drive a particular route. Drivers should only be rerouted when it is highly probable that they will save an appreciable amount of time (e.g., 15 minutes or more).

Improved Safety

Drivers may want to change their routes or delay their trips in order to avoid hazardous situations such as icy roads, high winds, reduced visibility (due to fog, dust, or snow), obstacles on roadways, and so forth. While these conditions may not cause congestion or traffic delays, they can pose substantial dangers, so they should be reported to drivers and they should be considered (and perhaps avoided) by route-guidance systems. Failure to do so could introduce legal liabilities.

Having route-guidance systems alert drivers to road-maintenance workers and emergency crews working on roadways will help to improve worker safety as well as driver safety.

Reduced Anxiety

A number of ATIS studies have shown that while real-time traffic information does not always help drivers to avoid delays, it does reduce their anxiety because, since they know the causes and probable lengths of delays, they can call ahead to tell others they will be late, they can put on a tape and make the most of the delay, or they can stop for coffee. Real-time traffic information gives drivers better situation awareness which lowers their anxiety. In order to provide this benefit to drivers, traffic-dependent route-guidance systems must do more than just tell drivers where to turn. They must present drivers with detailed traffic information including the causes and estimated magnitudes of unavoidable delays.

Real-Time Traffic Information

To make good traffic-based route decisions, drivers and route-guidance systems can utilize a variety of real-time information including:

- ✦ Locations, magnitudes, and causes of delays and their estimated times to clear
- ✦ Information about new accidents, sports events, construction, etc., not yet causing delays but which could cause delays by the time drivers reach them
- ✦ Speeds and travel times on roads and freeways
- ✦ Locations and descriptions of safety hazards

Presently, the most extensive source of real-time traffic information available in the U.S. is incident information. This information consists of accidents, congestion, lane obstructions, road work, material spills, stalls, animals on roadways, road conditions, road weather, damaged pavement, hazardous conditions, special events (sporting events, concerts, etc.), police actions, transit accidents, and all other types of incidents, events, and conditions that could impact travel time and/or travel safety. These occurrences and conditions collectively are referred to as "incidents." Westwood One and Etak presently are collecting, fusing, and disseminating incident information from 65 metropolitan areas throughout the United States.

The database fields that describe each incident consist of the incident type, incident description (including the international standards description ID), location (including standards compatible location ID, lat/lon, on-road name and direction, closest cross-road name, next and previous cross-road names), extent of backup, traffic impact, added-delay time, report time, update time, expected time to clear, diversion advice, detailed text description of the incident, and so forth. The information in these various fields for each incident is updated frequently as traffic situations evolve and as additional information becomes available. The incident-location, added-delay-time, time-to-clear, and extent-of-backup information fields are particularly useful for dynamic route- guidance applications. The incident-description is useful to drivers and routing advisors for forecasting the evolution of incidents and traffic delays.

The incident information comes from surveillance aircraft, CCTV cameras, cell-phone callers, fleet operators, freeway service patrols (e.g., Highway Helpers), car and van pool drivers, local and state police, emergency dispatch centers, state and local DOTs, toll operators, special event operators (arenas, stadiums, theaters, etc.), and a variety of other public and private sources.

Etak and Westwood One are now adding traffic speeds and travel times in uniform formats to their Traveler Information database from cities where such information is available. Currently speed information primarily comes from inductive loops imbedded in the road pavement and operated by state and local DOTs. In a few instances information also is available from Radar Traffic Monitoring Systems (RTMS), traffic probes, and toll-tag tracking systems. Useful speed and/or travel-time information is presently collected by DOTs, primarily on freeways, in about a dozen U.S. metropolitan areas.

A number of private sector companies propose to deploy extensive speed and/or travel-time monitoring systems based on non-cooperative-cell-phone tracking, toll-tag tracking, RTMS, license-plate readers, CCTV cameras, floating cars (i.e., traffic probes), and several more exotic technologies. None of these proposed technologies has yet achieved any large-scale deployment. Most of them suffer from high costs and/or from serious uncertainties about their technical feasibilities, scalabilities, schedules, costs, and/or performance characteristics. Hence, considerable uncertainty exists as to when (if ever) these various technologies will provide significant speed and/or travel-time coverage in the U.S.

User Preferences

Systematic studies of driver preferences with regard to traffic-dependent route-selection, route-guidance and user interfaces would be very helpful to product developers, particularly in the United States. How many and what types of drivers prefer map-displays of traffic information that give them complete control in devising their own routes? How many and what types of drivers prefer receiving real-time traffic information for their own pre-defined routes? How many prefer traffic-dependent turn-by-turn route guidance and how much control do they want in deciding the particular routes that they follow? What kinds of user interfaces are preferred for each traffic-dependent routing functionality under different circumstances? How do these preferences differ among commuters, fleet drivers, and rental car drivers?

In order to answer these and other questions, comparative market evaluations are needed for various traffic-dependent routing functionalities and user interfaces under a

variety of actual driving conditions and for a wide variety of drivers.

Conclusions

Based on real-time traffic information, traffic-dependent route selection and guidance can enable drivers to select and change their own routes in real-time, choose among pre-defined routes, or let computers select and change their routes and guide them with turn-by-turn directions. In all cases, it is critical that sufficient information be provided to the drivers and route-guidance systems so that changes in traffic conditions that are likely to occur on routes during trips are taken into account. Hence, it is not sufficient to know only traffic speeds and travel times. The sources of current delays and of predictable future delays must also be understood and used to forecast changes in route delays which will occur during a trip. Such information is contained within incident reports that are now available from a single IP address for 65 of the largest metropolitan areas throughout the U.S. Since local drivers may be aware of route choices and route problems that are unavailable to computer route guidance systems, consumer preferences may require such systems to provide drivers with complete incident information and with the ability to override their automatic route-guidance functionality when they choose to take an alternative route. Finally, market studies based on actual use in realistic driving conditions of driver preferences for various traffic-dependent route-guidance functionalities and user interfaces would be very helpful in designing future traffic-dependent route-guidance products and services.

Reference

1. Latshaw, Gary L., Ph.D., "Survey and Analyses of the Availability and Characteristics of Highway Speed Data," Proceedings of the ITS America ITS 2000 Tenth Annual Meeting and Exposition, Boston, MA, 1-4 May 2000.

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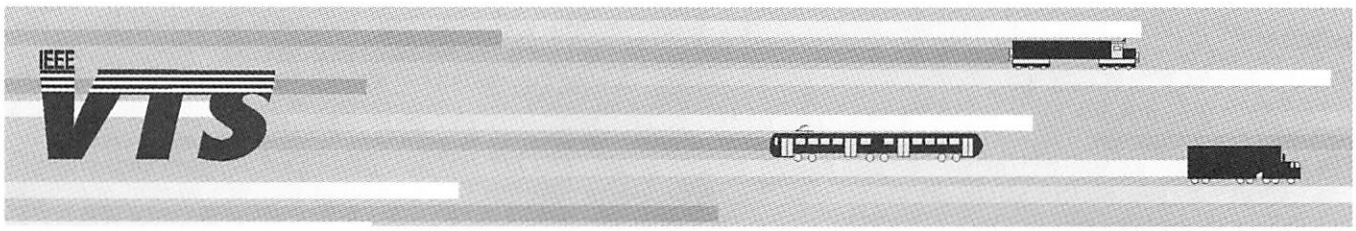

TD-SCDMA: Way to the future

Guiliang Yang, Chenguang Li, Jinling Hu, Datang Mobile Co

TD-SCDMA is one of the 3G global standards with advanced technologies. It is accepted by the ITU and is being developed in the 3GPP community. This paper briefly introduces the network structure of TD-SCDMA and the air interface where the main features and key technologies (antenna technology, synchronization technology, handover technology, receiving technology) of TD-SCDMA are located. TD-SCDMA will support various services including voice, data (circuit switched data and packet switched data) services and others. TD-SCDMA supports different deployment scenarios including macro cell and micro cell, as well as pico cell operation.

Introduction

During the last past two decades of the last century, two generations of mobile communications systems have been developed: the first generation (1G) of analog systems including e.g. AMPS, TACS and the second generation (2G) digital systems including e.g. GSM and IS95 CDMA. Under the framework set by International Telecommunication Union (ITU), TD-SCDMA is submitted by China as a candidate RTT for IMT-2000 in June 1998 and was approved in May 2000 [1].

In 3GPP, the harmonization of TD-SCDMA and UTRA TDD started from the year 2000 and was completed in March 2001, when TD-SCDMA standard was included in 3GPP Release 4 specifications as 1.28Mcps TDD mode.

In the year 2000, TD-SCDMA forum (http://www.tdscdma-forum.org) was formed by CATT (China Academy of Telecommunication Technology), Siemens, China Telecom, China Mobile, China Unicom, Huawei, Motorola and Nortel to provide a place for interested companies to further investigate and understand TD-SCDMA.

TD-SCDMA technology was initiated by CATT according to the ITU proposal guidelines [2] and is based on the previous SCDMA wireless local loop system. This system uses synchronized CDMA technology with smart antenna (http://www.xinwei.com.cn). The first version of TD-SCDMA air interface standard was developed within China Wireless Telecommunication Standard Group (CWTS), and this was subsequently integrated in 3GPP by various Standard Develop Organizations (SDO) as the 1.28Mcps TDD (low chip rate TDD) mode [3].

TD-SCDMA uses a combination of synchronized CDMA and TDMA/TDD multiple access technology together with smart antenna, baton handover, and uplink synchronization, amongst other technologies. TD-SCDMA shares the common high layer protocol stack and Core Network (CN) with the 3.84Mcps TDD and FDD mode in 3GPP specifications [4][5]. Within the 3GPP specification, TD-SCDMA (1.28Mcps TDD), UTRA TDD (3.84Mcps TDD) and WCDMA (FDD) are included as different modes. Both TDD

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and FDD share the same higher layer (L2 and L3) protocol stack, but with specific physical features and technologies.

Network Architecture

Figure 1 shows the TD-SCDMA network architecture [6].

In TD-SCDMA system, the Radio Access Network (RAN) consists of a set of Radio Network Subsystems (RNS) connected to the Core Network through the Iu interface.

An RNS consists of a Radio Network Controller (RNC) and one or more Node Bs. Node Bs are the UMTS equivalent of Base Transceiver Stations, transmitting to a cell. A Node B is connected to the RNC through the Iub interface.

Inside the RAN, the RNCs of the Radio Network Subsystems can be interconnected together through the Iur interface. The Iur is a logical interface that can be conveyed over direct physical connection between RNCs or virtual networks using any suitable transport network.

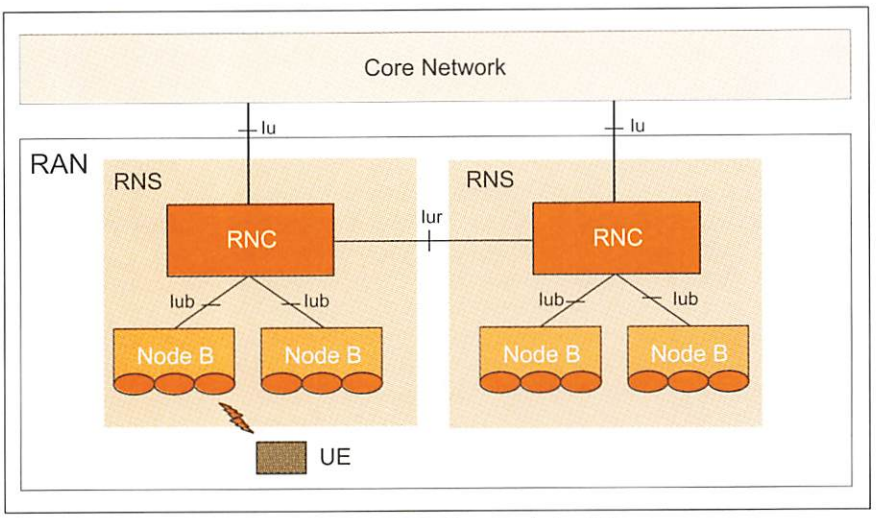

Figure 1 TD-SCDMA Network Architecture

Air Interface Protocol Stack

TD-SCDMA air interface has three protocol layers [7]:

- Physical layer, Layer 1 (L1);
- Data link layer, Layer 2 (L2);
- Network layer, Layer 3 (L3);

Layer 2 is the data link layer according to OSI structure model and it is split into following sub-layers:

- Medium Access Control (MAC);
- Radio Link Control (RLC);
- Packet Data Convergence Protocol (PDCP);
- Broadcast/Multicast Control (BMC).

Layer 3, the network layer, will include the Radio Resource Control (RRC) sub-layer.

Layer 3 and RLC are divided into Control (C-) and User (U-) planes. The PDCP and BMC exist in the U-plane only.

Figure 2 shows the radio interface protocol architecture. Each block in the figure represents an instance of the respective protocol. Service Access Points (SAP), for peer-to-peer communication, are marked with circles at the interface between sub-layers. The SAP between the MAC and the physical layer provides the transport channels. The SAPs between RLC and the MAC sub-layer provide the logical channels. The RLC layer provides three types of SAPs, one for each RLC operation mode (Acknowledged Mode, Unacknowledged Mode and Transparent Mode). The PDCP and BMC are accessed by PDCP and BMC SAPs, respectively. The service provided by Layer 2 is referred to as the radio bearer. The C-plane radio bearers, which are provided by the RLC to the RRC, are denoted as signaling radio bearers.

A detailed description of TD-SCDMA protocol stack can be found in [7].

Physical layer Structure

Physical layer provides data transport services to higher layers through the use of transport channels via the MAC sub-layer. The characteristics of a transport channel are defined by its transport format (or format set), such as convolutional channel coding and interleaving, and any service-specific rate matching as needed [8].

The physical layer interfaces to the Medium Access Control (MAC) sub-layer of Layer 2 and the Radio Resource Control (RRC) Layer of Layer 3. The physical layer offers different transport channels to the MAC. A transport channel is characterized by how the information is transferred over the radio interface. The MAC offers different logical channels to the Radio Link Control (RLC) sub-layer of Layer 2. A logical channel is characterized by the type of information transferred. Physical channels are defined in the physical layer. In TD-SCDMA system, a physical channel is characterized by the timeslot, code, and frequency used. The physical layer is controlled by RRC.

A user's terminal, known as a User Equipment (UE), can set up multiple transport channels simultaneously, each having its' own transport characteristics (e.g. offering different error correction capability). Each transport channel can be used for information stream transfer of one radio bearer or for Layer 2 and higher layer signaling messages. The multiplexing of these transport channels onto the same or different physical channels is carried out by Layer 1. In addition, the Transport Format Combination Indication field (TFCI) uniquely identifies the transport format used by each transport channel of the Coded Composite Transport Channel (combination of transport channel, see detailed description in [8]) within the current radio frame.

Figure 3 shows the frame structure of TD-SCDMA physical layer. A radio frame has a period of 10ms which is aligned with the Transmission Time Interval (TTI) of the data block. Each 10ms radio frame is divided into two 5ms sub-frames. Within each sub-frame, 7 traffic time slots (TS0 – TS6), 2 pilot time slots (DwPTS and UpPTS) and one guard period (GP) are defined.

The Guard Period has the length of 96 chips with the duration of 75μs. It provides the separation for TDD operation to avoid the uplink and downlink overlaping due to the radio propagation delay. In normal operation scenario, the guard period is long enough to provide for cells of more than 11km radius.

DwPTS and UpPTS are defined as downlink and uplink pilot time slot respectively. The DwPTS contains the downlink pilot code (SYNC-DL) with the code length of 64 chips from the code group to provide the function of cell search, User Equipment frequency tracing, and to distinguish different cells. The SYNC-DL code sequences in the DwPTS are modulated with respect to the midamble in time slot 0 (TS0). Four consecutive phases (phase quadruple) of the SYNC-DL code are used to indicate the presence of the broadcast channel in the following 4 sub-frames. The UpPTS contains the uplink pilot code (SYNC-UL), with a code length of 128 chips from the code group determined by

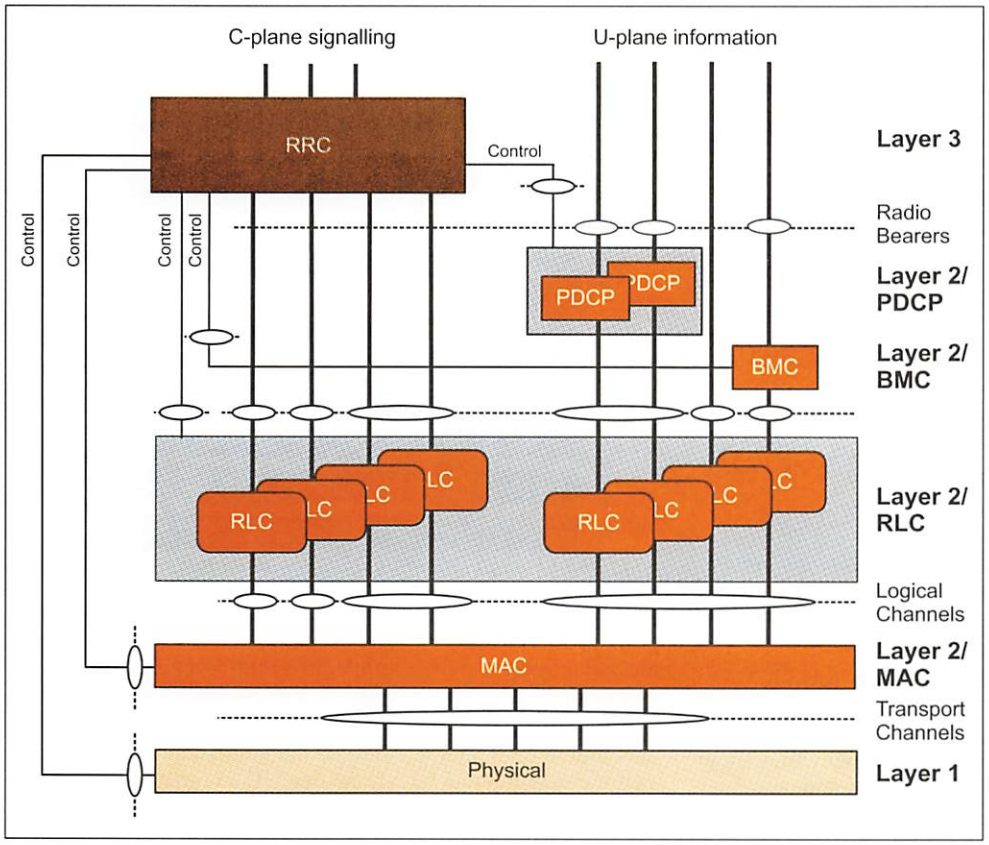

Figure 2 Air Interface Protocol Stack

SYNC-DL code. The SYNC-UL code is used by the User Equipment for the first uplink transmission during access.

Within the traffic time slots (TS0-TS6), the slot structure is defined. The 'midamble' is located in the middle of the time slot to provide the channel estimation and channel recovery. An 'L1 control' field in slot structure provides the physical layer control command e.g. power control (TPC), synchronization control (SS), TFCI, and so on. 'Data' fields carry the traffic data including voice, data, signaling, etc. At the end of each time slot, a small guard time 'g' is configured to reduce the interference between time slots due to the propagation delay.

Among the seven traffic time slots, TS0 is always allocated as a downlink slot while TS1 is always allocated as uplink. The time slots for the uplink and the downlink are separated by switching points. Between the downlink time slots and uplink time slots, the special period is the switching point to separate the uplink and downlink. In each sub-frame of 5ms in TD-SCDMA, there are two switching points (uplink to downlink and vice versa).

Transport Channel and Physical Channel

Transport channels are the services provided by the physical layer to the higher layers. Transport channels are classified into two groups: dedicated transport channels and common transport channels.

A dedicated channel (DCH) is an uplink or downlink transport channel using the inherent addressing of User Equipment (UE) to carry user or control information between the that device and the Radio Access Network.

A common channel carries information intended for a number of different UEs, or can be accessed by several UEs. There are six types of common transport channel:

- Broadcast Channel (BCH) is a downlink transport channel for broadcast information and cell specific information.
- Forward Access Channel (FACH) is a downlink transport channel to carry control information to an UE when its location cell is known. FACH also carries short packets of user data.
- Paging Channel (PCH) is a downlink transport channel to carry control information to an UE when its location cell is not known by the system.
- Downlink Shared Channel (DSCH) is a downlink transport channel shared by several UEs to carry dedicated or control data.
- Random Access Channel (RACH) is an uplink transport channel for control information from the UE. RACH also carries short packets of user data.
- Uplink Shared Channel (USCH) is an uplink transport channel shared by several UEs to carry dedicated or control data

A physical channel is defined by its frequency, timeslot, and channelization code, burst type and Radio Frame allocation. The scrambling code and the basic midamble code are broadcast and may be constant within a cell. When a physical channel is established, a start frame is given. The physical channels can either be of infinite duration, or the duration of the allocation can be defined.

The TD-SCDMA physical channel includes the dedicated physical channel (DPCH) and the common physical channel (CPCH). There are several types of common physical channel:

- Primary Common Control Physical Channel (P-CCPCH): This has a fixed position of the first two channalization codes in TS0 with the fixed spreading factor of 16, to carry the common control command and information e.g. cell broadcast information.

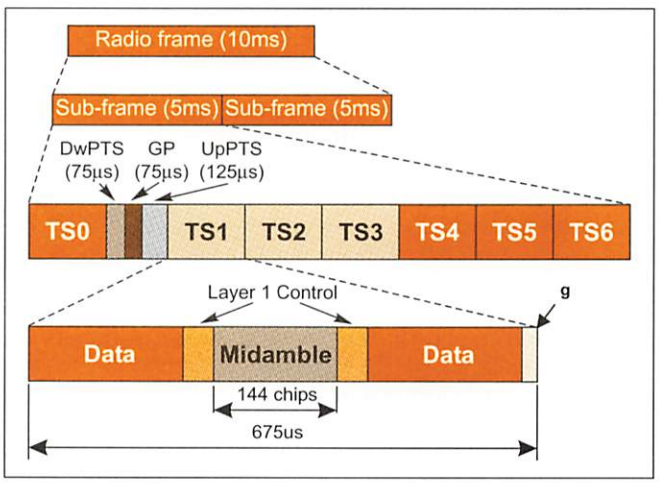

Figure 3 TD-SCDMA Frame Structure

- Secondary common control physical channel (S-CCPCH): This has a fixed spreading factor of 16. The number of codes used and their location will be broadcast, and will depend on the PCH/FACH capacity requirement to carry common control and information, for example paging and forward access.
- Physical Random Access Channel (PRACH).
- Physical Uplink Shared Channel (PUSCH), which carries uplink packet data traffic.
- Physical Downlink Shared Channel (PDSCH), which carries downlink packet data traffic.
- Page Indicator Channel (PICH), which indicates classified paging group information.
- Fast Physical Access Channel (FPACH): This uses one code with a spreading factor of 16. The number and location of this can be configured by broadcast information. The channel carries physical access commands.
- Synchronization Channels (DwPCH, UpPCH): The location of these channels is fixed in the dedicated time slots of DwPTS and UpPTS. The channel is used to carry uplink and downlink synchronization references.

Figure 4 shows the mapping of transport channel and physical channel [9].

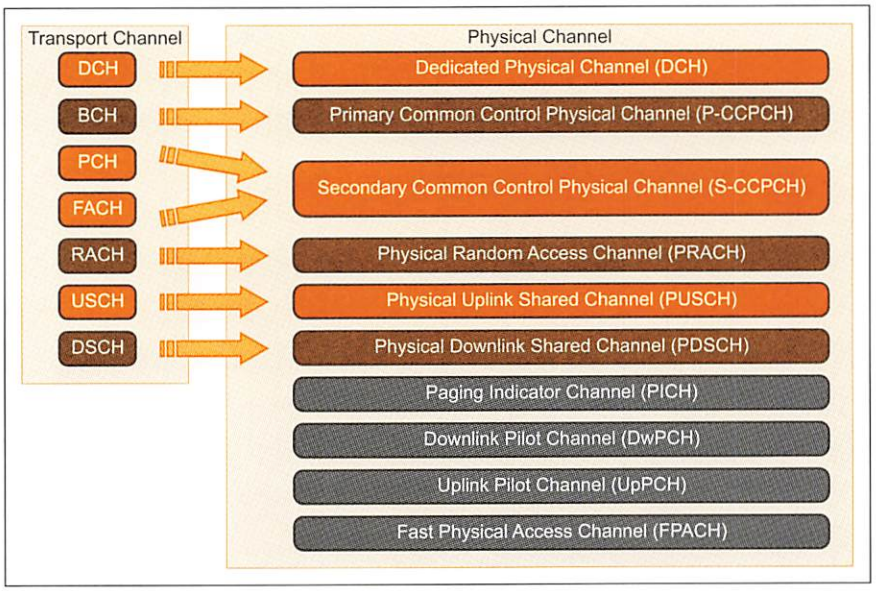

Figure 4 TD-SCDMA Transport Channel and Physical Channel Mapping

Physical layer procedure

TD-SCDMA is a system designed to make use of a number of new technologies such as smart antenna (adaptive antenna), uplink synchronization, baton handover, and multi-user detection. TD-SCDMA can also be operated with reduced performance (for example, reduced capacity or cell coverage) when these technologies are not implemented.

TD-SCDMA is one of the TDD modes in the 3GPP specification of WCDMA. Most of the physical layer technology like coding, interleaving, modulation, etc. are common for both TD-SCDMA and WCDMA. For example, the coding rates for TD-SCDMA are 'no coding', 1/2, 1/3 and also turbo coding according to different service and data transmission demand. That means in a basic resource unit (with spreading factor of 16) of one code channel in the time slot, the data rate can be up to about 17.6kbps.

In the TD-SCDMA physical layer, a dedicated frame structure is defined with specific time slots (e.g. DwPTS, UpPTS). Together with the physical layer structure, some special physical layer procedures are defined [10].

Cell search: The Node B always transmits DwPTS in omni-directional pattern as a downlink synchronization channel to all the UEs. The first step for the UE when it makes a cell search after power on is to search the SYNC-DL code used in the DwPTS from the 32 possible codes. When the SYNC-DL code used for the cell is detected, the timing (TS0 schedule) of the sub-frame is determined. The UE may calculate and align to the interleaving block according to the phase sequence of DwPTS. Then the UE will be able to read the broadcast information from the fixed position of P-CCPCH in TS0.

Random access: When the UE is in standby, it is able to make random access. The UE chooses one from the eight SYNC-UL codes in the same code group. Based on the estimated transmit power and timing, the UE sends an uplink burst in UpPTS. The Node B will generate and send the power control command (TPC) and synchronization control command (SS) in FPACH channel based on the received uplink signal so as to adjust the UE's transmitting power level and timing advance. At this stage, uplink synchronization is established. Then signaling will be exchanged between UE and Node B for random access.

Uplink Synchronization: Uplink synchronization is established during the random access. When the UE is in connected mode, uplink synchronization needs to be maintained. This uses a synchronization shift (SS) command defined in the Layer 1 control field in the burst structure of time slot.

Key Technologies

Smart Antenna: The TD-SCDMA system uses adaptive antenna arrays to provide omni/directional receiving and transmission. Smart antennas are able to create a beam-formed wave pattern to trace the active UE. Using smart antennas will reduce inter-cell and intra-cell interference, reduce the transmitting power level required for coverage.

Uplink Synchronization: The scheme of uplink synchronization is introduced to TD-SCDMA as described above. Uplink synchronization is also designed to reduce the multiple access interference and to simplify the signal processing for receiver.

Baton Handover: Smart antennas are able to provide additional UE location information (as described below). The direction and distance information will be used to enhance the performance and reduce the measurement effort for handover. Both Node Bs create beam formed patterns for communication with the UE during handover. Handover is a procedure for beam exchange.

Multi-User Detection: Multi-user detection is combined with smart antenna technology in TD-SCDMA systems to reduce the interference by multi-path propagation. All the code channels in the same time slot are to be estimated using the midamble and demodulated.

Services

TD-SCDMA uses a combination of TDMA and CDMA technology which means in the time domain, time slots are defined and allocated for uplink and downlink traffic. Within

each time slot, CDMA code channels are defined. The spreading factor can be dynamically adjusted according to the services. For low speed services such as voice, a large spreading factor may be allocated to support up to 16 CDMA code channels in the same slot. For high speed services, a small or even zero spreading mode may be selected. With no spreading, the system corresponds to TDMA.

Voice: TD-SCDMA systems are able to use AMR (Adaptive Multi-Rate) voice codec. In each TD-SCDMA RF carrier (1.6MHz), there are 7 traffic time slots with maximum 16 codes in each time slot. In a general scenario, TD-SCDMA is configured to symmetric operation (TS0 as downlink common control channel, TS1 to TS3 as uplink traffic, TS4 to TS6 as downlink traffic) as shown in Figure 5.

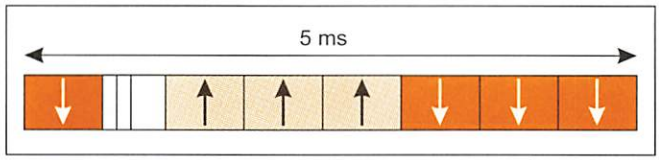

Figure 5 Symmetric Configuration of TD-SCDMA sub-frame

For voice service, one or two pairs of uplink/downlink codes will be occupied according to voice coding rate. For example, when the 8kbit/s codec in AMR is selected, only one channalization code for uplink and one channalization code for downlink will be used to provide the voice service.

Data: The TD-SCDMA system is flexible and can provide asymmetric data traffic as well as symmetric data traffic to support both the circuit switched and packet switched data services. According to the service demand, the switching point can be re-configured to allocate different uplink and downlink time slot resources. This gives TD-SCDMA flexiblity to support and allocate resource for various service demands. When more downlink resources are required by the service, like when downloading data, the switching point can be adjusted to allocate more downlink time slots. For the case of requirements for more uplink resources, the switching point can be shifted to another position. Then the uplink and downlink can share the common time slot resources. Figure 6 shows an example of asymmetric configuration to allocate 5 downlink time slots and 2 uplink time slots.

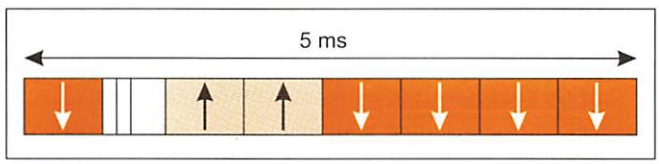

Figure 6 Example of Asymmetric Configuration of TD-SCDMA sub-frame

Other services: In a TD-SCDMA system, the smart antenna is able to get directional information for active UE. Combined with the distance information calculated from uplink time advance adjustment, it is possible to provide a UE location service by measurement from unique Node B.

The security function for TD-SCDMA is achieved by high layers. The algorithm and scheme are common for WCDMA and TD-SCDMA.

The QoS is one of important aspects for 3G. Concerning the features of TD-SCDMA, the RRM (radio resource management) will control the whole radio access network by means of access control, packet scheduling, power control, dynamic channel allocation, etc.

Operation Scenario

TD-SCDMA system is designed to operate in various scenarios. Marco cell, micro cell and pico cells will be supported by TD-SCDMA according to operator's deployment requirements. As one of the 3G standards, TD-SCDMA will use the TDD spectrum allocated to 3G systems, while WCDMA and CDMA2000 use the FDD spectrum which is separate from the TDD spectrum.

In addition, TD-SCDMA can be adopted as an air interface to a GSM core network to provide 3G services. In this case, TD-SCDMA air interface radio transmission technology will be adopted with the GSM protocol stack. This can give a smooth migration path from GSM to 3G.

A TD-SCDMA trial system was established in the first quarter of 2002. The result of these demonstrations shows that the coverage of TD-SCDMA is larger than 16km, and the moving speed supported by TD-SCDMA is higher than 125km/h. TD-SCDMA systems also can be configured to provide even larger coverage to 40-50km, but with specific Node Bs and high class UEs with high transmission power capability. With the increase of processing power of advanced chipsets, simulation results suggests moving speed of 250km/h can also be supported.

Some new technologies such as HSDPA (High Speed Downlink Packet Access) and MIMO (multiple input and multiple output) are considered in 3GPP also for TD-SCDMA to increase the supported data rate and the performance.

Summary

As a member of the IMT-2000 standard family of ITU, the TD-SCDMA standard is integrated with WCDMA and UTRA TDD in 3GPP community, so guaranteeing their compatibility.

TD-SCDMA is a system that fulfills the ITU requirement for IMT-2000 and provides flexible operation of frequency allocation in any available spectrum. The multiple time-slot structure also allows TD-SCDMA to provide voice and data service with more flexibility. Considering the specific features, TD-SCDMA is foreseen as a low cost system with high performance, flexible operation, high spectrum efficiency. It is proposed that TD-SCDMA is the only 3G TDD system that would be implemented in China.

References

[1] ITU-R M.1457, "Detailed Specification of the Radio Interface of IMT 2000"

[2] ITU-R M.1225, "Guideline for Evaluation of Transmission Technologies for IMT 2000"

[3] Li Jun, Yang Guiliang, Zhang Xiaoli, "Progress of Standardization TDD for Low Chip-rate in IMT-2000", China Mobile Telecom, No.5, 2001

[4] Li Shihe, Li Jun, "TD-SCDMA RTT overview", China Mobile Telecom, No.1, 2000

[5] Yang Guiliang, Li Feng, He Yusong, "Introduction on Air Interface Technologies for TD-SCDMA RTT", China Mobile Telecom, No.2, 2000

[6] CWTS STD-TDD 25.401 V4.2.0, "UTRAN overall description"

[7] CWTS STD-TDD 25.301 V4.2.0, "Radio interface protocol architecture"

[8] CWTS STD-TDD 25.201 V4.1.0, "Physical layer – General Description"

[9] CWTS STD-TDD 25.221 V4.1.0, "Physical channels and mapping of transport channels onto physical channels"
[10] CWTS STD-TDD 25.224 V4.1.0, "Physical layer procedure"

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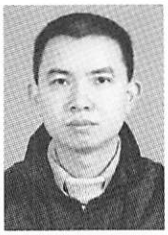

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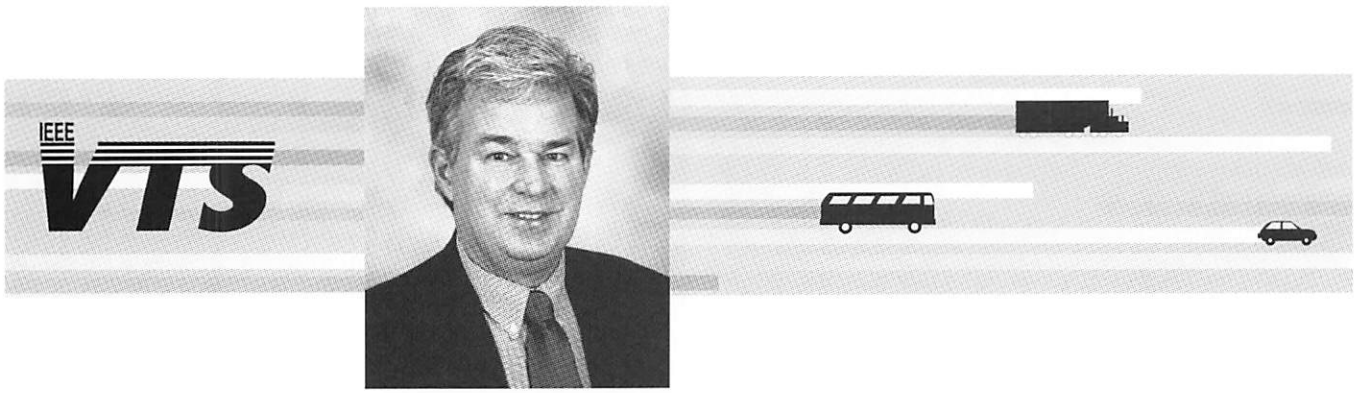
JinLing Hu is responsible for TD-SCDMA physical layer standard. She has worked for Datang (CATT) in New Technology Department since 1998, when she got her Master degree from Beijing University of Aeronautics and Astronautics.



Automotive Electronics

Bill Fleming, Senior Editor

Rethinking Telematics

Not long ago, there were wildly optimistic forecasts for the market acceptance and success of telematics† [1].

Last January, the Consumer Electronics Show in Las Vegas put out an optimistic news release stating that, "the move towards navigation and video telematics systems was currently the strongest new area in automotive electronics, seemingly springing up overnight" [1]. New telematics products were displayed in Las Vegas, including:

- A Delphi/Intel system that allowed uploading and downloading of movie and audio files from home to car, using very fast 54-Mbit/sec, 802.11a protocol, 5-GHz, wireless technology
- Delphi/MobileAria hands-free Internet access, using a Bluetooth-enabled laptop interface was demonstrated
- A Visteon/Sirius satellite radio receiver
- A Mercedes-Benz/Tele Aid emergency roadside assistance unit.

Paul Hansen was the first one to issue a warning. In December 2001, he stated that: "telematics subscriptions had grown very little in the first four years since their introduction. Even in electronics-gadget-loving Japan and Germany, telematics hadn't yet blossomed" [3]. Since then, a number of factors were identified for the apparent failure of telematics; namely [2,4]:

1. Initial cost was too high.
2. Automakers/suppliers failed to find a "killer app" that could appeal to a broad group of consumers.
3. The business model of market leader, OnStar had too high of a monthly fee, and it required consumers who already owned cell phones to deal with two sets of phone bills — one for their personal phone, plus another for their OnStar vehicle-embedded phone.
4. OnStar's embedded-phone configuration also created a problem for people who didn't want their phone systems limited to the confines of their automobile.
5. Telematics subscribers in Europe and Japan were almost nonexistent.
6. Multimedia standards were too slow in coming, resulting in longer development times and higher prices.

Predicted revenue estimates for telematics have been steadily downsized. For example, in September 2000 the predicted revenue for the year 2010 was $22 billion in U.S. sales, but in November 2001 the forecast was for a more modest $15 billion [2]. In March 2000, Ford Motor announced the formation of Wingcast LLC, a joint venture with software maker Qualcomm. Originally, the partners predicted they would install telematics equipment on more than 1 million Ford vehicles in 2002. But in

†By way of definition, automotive telematics involves two-way communication of voice or data to the motorist. This can include route guidance, e-mail, emergency roadside assistance, and/or concierge services.

August 2001, Ford cut back its investment, and as of March 2002, the automaker decided to only install Wingcast hardware in one or two Lincoln car models this coming model year [2].

According to Paul Hansen's[‡] calculations, renewal rates for the OnStar telematics system subscriptions were only 42 percent in 2001, a level insufficient to cover costs, pay back investments, and still leave a profit [5].

Other articles — for example [6,7] — similarly report decreased interest in telematics. On an upbeat note, Hansen concluded that, "if universal standards can be put in place, and costs can be brought down, some time within the next decade consumers will ultimately be willing to pay for telematics services [5]."

Universal Cell Phone Platforms

In the list of reasons above for the apparent failure of telematics, the 4th reason was, "people wanted systems that weren't limited to the confines of their automobile, and systems that didn't require consumers who already own cell phones to have to deal with two sets of phone bills." New telematics systems, based on universal docking stations, will likely appeal more broadly to consumers for this very reason; i.e., they'll let drivers use their own cell phones, without necessitating an extra phone number and extra set of telephone bills [4].

Instead of utilizing vehicle-embedded phones, universal docking stations provide a hands-free voice direct interface with your personal cell phone. In May 2002, Ford Motor said that 5500 of its dealerships would adopt and offer universal docking platforms. Similarly, Chrysler Group announced in spring 2002 that they would offer a universal cell phone platform employing Bluetooth radio technology [8]. This means that even if the cell phone is in the driver's pocket, it can transmit and receive with the docking platform, and the vehicle will transmit voice through its speakers to allow hands-free phone operation. [A key supplier of this technology (to Ford Motor), Cellport; plans to sell its automotive business to "some other Tier One supplier better suited to handle the sudden demand [9]." However, this isn't expected to have any lasting effect on the universal cell phone systems development].

Automotive Safety Data Bus

Automakers are still unable to agree on a common data bus configuration for safety-critical electrical drive-by-wire systems. There are two competing approaches vying for the safety-critical data bus business:

1. The FlexRay approach, which offers flexible time-division media access slots for data, and includes both static (fixed time-slot) and dynamic (variable time-slot) data communication [10].

and

2. The Time-Triggered Architecture approach, which provides time-slot-based, time division multiple access, with robust bus-guardian protection against signaling errors [10].

Last April 2002, Ford Motor and Texas Instruments joined General Motors and DaimlerChrysler, BMW, Motorola, Philips Semiconductor, and Bosch in the FlexRay Consortium, bringing FlexRay to the verge of being the de facto industry standard [11].

Editor's Notes.

1. *Controller Area Network (CAN) buses, currently used in automotive powertrain applications, are not considered reliable enough for by-wire steering and braking system use. This explains the need and interest in the above safety-critical data buses.*
2. *These safety-critical data buses are required to implement by-wire steering, braking, and throttle systems. Availability of the by-wire systems will facilitate the introduction of, and will make more efficient, the operation of next generation vehicle systems such as: (i) radar adaptive cruise control, (ii) automatic lane keeping, and (iii) collision avoidance.*

More on Distraction

General Motors gathered OnStar field data from 1996 through 2000 and reported the following results [12]:

- Over 1.2 million vehicles were equipped with an (activated) OnStar system.
- Overall, one air bag crash occurred, for every million OnStar advisor phone calls.
- During this time period, there were a total of 8.1 million calls placed to OnStar (70 percent from vehicles that were moving), and there were only two times that the driver was known to be on the phone at the time of a crash severe enough to deploy the vehicle's air bags.

Along this same line, the U.S. Agency, NHTSA (National Highway Traffic Safety Administration), after analyzing over 32,000 drivers nationwide, concluded that eating-while-driving was a bigger distraction than using a handheld cell phone. In a related study, Hagerty Classic Insurance ranked the top ten-worst foods responsible for hazardous driving. And (following Dave Letterman's nighttime show style), starting with number ten, the 10 most-hazardous foods were found to be:

Ten Worst Foods Responsible for Hazardous Driving [13]

Rank	Food	Rank	Food
10th.	*chocolate*	5.	*juicy hamburgers*
9.	*soft drinks*	4.	*chili*
8.	*jelly/cream-filled donuts*	3.	*tacos*
7.	*fried chicken*	2.	*hot soup*
6.	*any barbequed food*	1. (*worst*)	*hot coffee*

Headlights Are Becoming Intelligent

Valeo announced a new headlight system called, "Bending Light." It beams light in the direction of road bends to optimize forward nighttime visibility on road curves [14]. Bi-Xenon projectors or reflectors in headlamps are motorized to permit rotation up to 20 degrees from the normal straight ahead aim direction. Motor actuators in each headlamp respond to sensor input signals from the steering wheel, wheel speed, and optionally from GPS; to direct the headlight beams in the direction of road bends.

An Italian concept vehicle, named the Yak, incorporates headlamps, fog lamps, and turn signals — all constructed entirely of high-brightness Luxeon LEDs, made by LumiLeds Lighting, <www.lumileds.com>. This is said to be the first use of high-brightness LEDs in automotive forward-lighting applications [15]. Each integrated lamp as-

[‡]Hansen, an automotive electronics market research consultant, recently authored a $557, 36-page, study on strategic and marketing issues facing telematics, and looming during the next decade — see <www.hansenreport.com/telematics.html>.

sembly consists of 36 LEDs for headlamp and turn signal functions, plus 10 LEDs for the fog lamp function. The LEDs in the headlamps are mated to Fraen Corp. optical elements, thin optical systems controlled by software, to generate different beam patterns.

References

1. C. Murray, "Media Revolution Dawns, But For Whom?" *Electronic Engineering Times*, pp. 1 and 18; Jan. 14, 2002.
2. D. Sedgwick et al., "Telematics: Golden Dreams, Red Ink — Short Circuit," *Automotive News*, pp. 30-32; March 4, 2002.
3. P. Hansen, "Telematics: No Profit Yet," *Automotive Industries*, p. 16; Dec. 2001.
4. C. Murray, "Dead On Arrival? Study Casts Pall Over Telematics" *Electronic Engineering Times*, pp. 1 and 108; May 27, 2002.
5. P. Hansen, "Rethinking Telematics," *Automotive Industries*, p. 16; April 2002.
6. M. Arnholt, "The Wave Has Crested — Telematics Hype Now Tempered With A Bit Of Reality," *WARD'S Auto World*, p. 34; April 2002.
7. S. Saint-Seine, "Go-Go Days Of Telematics Optimism [In Europe] Have Fizzled," *Automotive News*, pp. 36H-36J; May 20, 2002.
8. C. Murray, "Cars To Dock Your Cell Phone" *Electronic Engineering Times*, pp. 48 and 70; April 29, 2002.
9. C. Murray, "Cellport To Sell Off Auto Business" *Electronic Engineering Times*, p. 2; April 22, 2002.
10. C. Murray, "Safety Bus: Time To Get On" *Electronic Engineering Times*, pp. 1 and 16; March 11, 2002.
11. C. Murray, "Ford, TI Opt For FlexRay Automotive Safety Bus" *Electronic Engineering Times*, pp. 4 and 22; April 29, 2002.
12. "Study Says Embedded Phone System Safe," *Automotive Industries*, p. 45; March 2002.
13. "Coffee, Other Food, Is A Major Distraction, Says Insurance Company," *Highway & Vehicle / Safety Report,* p. 8; May 27, 2002.
14. "Intelligent Headlights," *Automotive Industries*, p. 40; May 2002.
15. D. Morrison, "LED Headlamp Illuminates New Automotive Uses," *Electronic Design*, p. 32; May 13, 2002.

Transportation Systems

Harvey Glickenstein, Senior Editor

The Long Island Rail Road (LIRR) has awarded a contract for 352 M7 electrical multiple unit cars to Bombardier Transportation. This contract is a follow-on to the 1999 order for 346 M7 cars.

The car bodies will be manufactured in Quebec, with final assembly at the Bombardier plant in Plattsburgh, NY.

The Baltimore Region Rail System Plan Advisory Committee has adopted a plan to add 63 new miles of rail in the Baltimore, MD metropolitan area. The long-range plan, which has been designated by six different colors, will be transmitted to the Maryland Transit Administration (MTA) for their review and approval. The MTA operates the existing Light Rail and Metro lines and oversees the MARC commuter service that is operated by Amtrak and CSX for the state of Maryland.

The Green Line is an extension of the existing Metro 16 miles further east from Johns Hopkins Hospital to Morgan State University, Hamilton, Overlea, and White Marsh. Two branches are shown beyond White Marsh, one to a new station along I95 and a second one to a commuter station near the Martin State Airport on the MARC commuter line between Baltimore and Perryville on Amtrak's Northeast Corridor. The line to Morgan State University is shown as a Phase I priority, with the rest of the service to be implemented beyond Phase II.

The Red Line is shown as starting west of I695 along I70 in Baltimore County, continuing through Social Security, Edmondson Village within Baltimore City, the west side of Baltimore, the Inner Harbor, east to Fells Point and then on to Dundalk and Turner's Station in Eastern Baltimore County. It would also have a branch line to Canton. Only the portion from Social Security to Fells Point is shown as a Phase I priority, with the rest of this line to be implemented beyond Phase II.

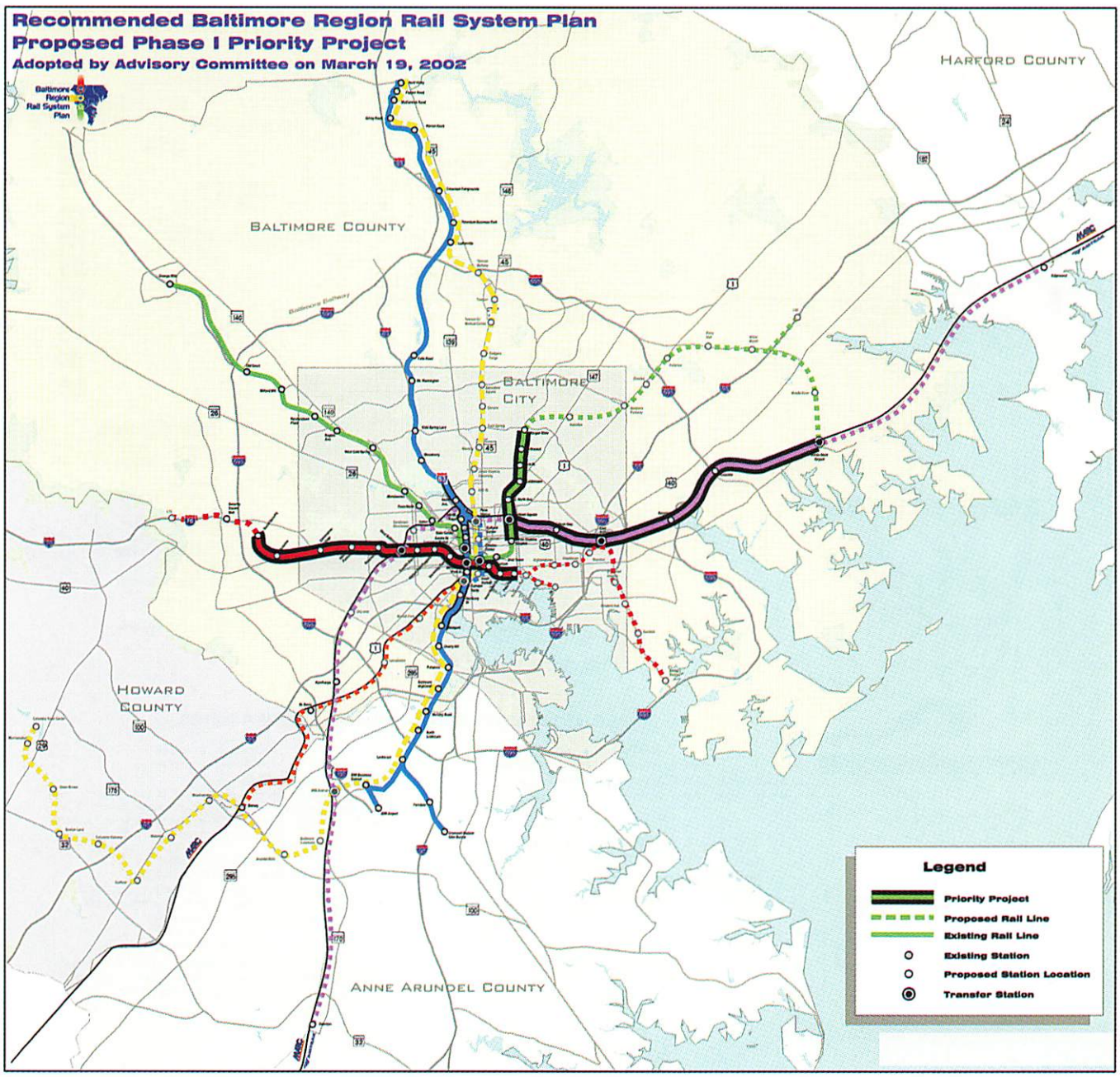
The Yellow Line is an extension of the existing Light Rail Line starting at Hunt Valley at the north end. It diverges from the existing Light Rail Line at Lutherville, below Timonium, operates to Towson, through to Johns Hopkins University, then south to Penn Station, continues on Charles Street south to the Inner Harbor, and then west to Camden Yards where it rejoins the existing line. It continues along the existing line to the BWI Business District stop, where it once again diverges. The line crosses Amtrak at the Amtrak BWI station, runs south and west through Arundel Mills, crosses the MARC service along the CSX at Dorsey in Howard County, and then meanders south, west, and north to end up at Columbia, MD. The portion from

BOMBARDIER TRANSPORTATION

Bombardier Transportation M7 EMUs for LIRR

BOMBARDIER TRANSPORTATION

Bombardier Transportation ALP-46 locomotives for NJ Transit



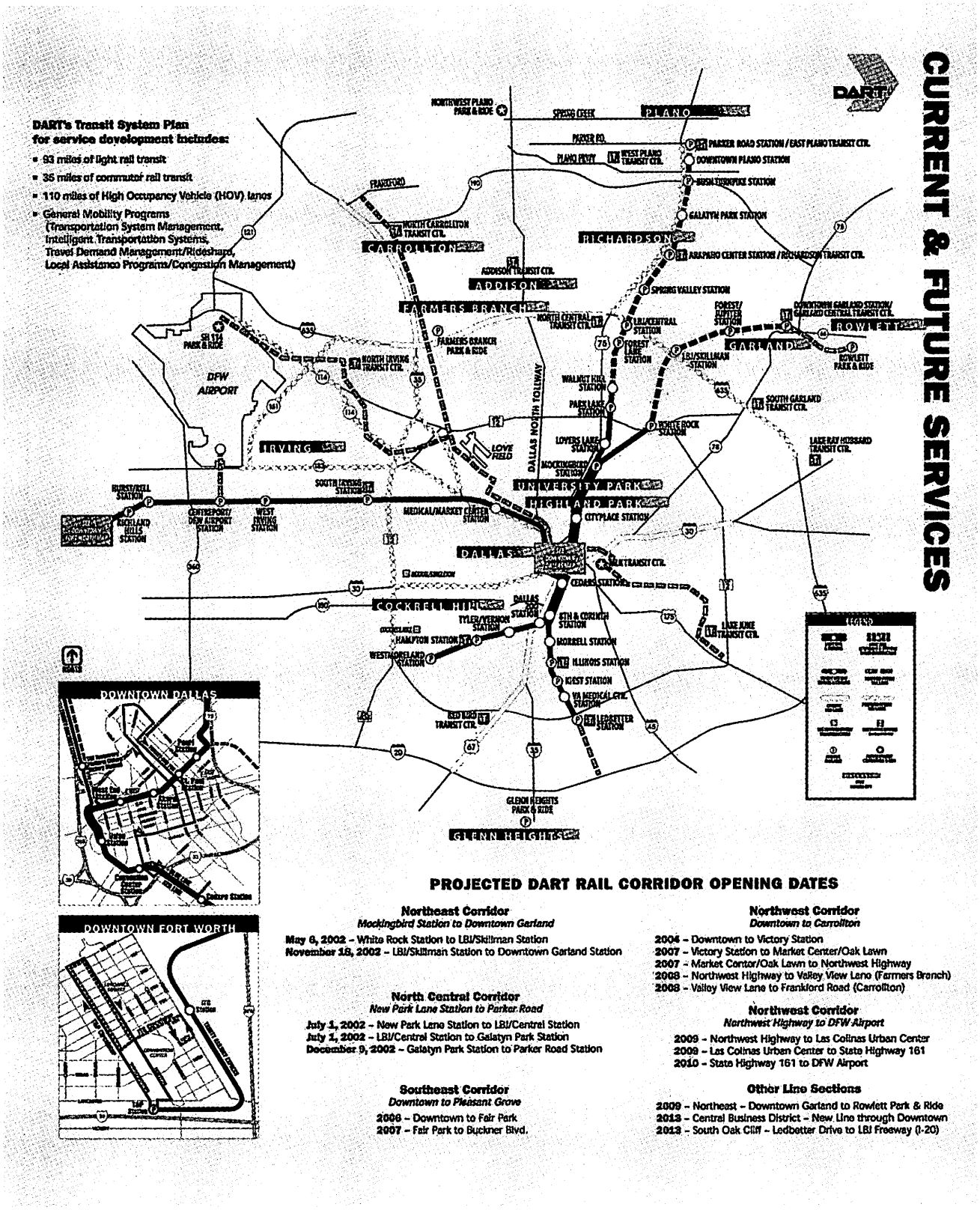
MARYLAND TRANSIT ADMINISTRATION

Baltimore Region Rail System Plan showing Phase 1 Priorities

Johns Hopkins University through Penn Station and the Inner Harbor to Camden Yards is shown as a Phase II priority. The balance of the line is intended to be implemented after Phase II.

The Blue Line portion is to create a loop from the North Avenue Station located north of Penn Station, through Penn Station, down Charles Street, on to the Inner Harbor and back to the existing line at Camden Yards. This would create a downtown loop for the Blue Line using existing trackage and the proposed Yellow Line trackage. Like the Yellow Line, this would be implemented as a Phase II priority.

The Orange Line and Purple Line propose new urban rail service in the rights-of-way used by the existing MARC commuter services on the CSX and Amtrak lines respectively.



Current and Future DART Services

Neither of these services appears to be contemplated until after Phase II.

Dallas Area Rapid Transit (DART) has opened its LBJ Skillman Station on May 6, 2002. The station art work and landscaping recognizes Lady Bird Johnson's promotion of the use of native plants, grasses, and flowers along transportation arteries.

Last issue discussed the DART expansion plans. The map that was printed did not print well, so here is an updated version of the map.

The Utah Transit Authority (UTA) has started construction on the extension of the TRAX Line to the Medical Center. The first TRAX light rail line north from Sandy to Salt Lake City is highly successful, carrying more passengers than originally projected. The second line, between downtown Salt Lake City and the Olympic Village at the University opened in time for the winter Olympics, and was similarly successful. UTA is now extending the line an addition 1-1/2 miles east from the existing terminus at the University to a new station adjacent to the Primary Children's Hospital in the University of Utah Medical Center. Construction started on May 20, 2002 and the extension is planned to open for revenue service by the end of 2004. UTA has ordered an additional seven cars, bringing their fleet size to forty, in order to service this extension.

New Jersey Transit unveiled its new Electric Locomotive, the ALP-46, and its new Comet V railcars. The ALP-46 electric locomotives will be supplied by Bombardier and the railcars will be supplied by Alstom. New Jersey Transit is also planning on ordering new bi-level cars from Alstom. These will be the first bi-level cars in the NJ Transit fleet.

Bombardier will supply 29 ALP-46 locomotives, each of which will be able to haul up to 12 single-level cars or 10 of the new bi-level cars. The existing ALP-44 locomotives used by NJ Transit are limited to hauling no more than 9 single-level cars. The new locomotives have a horsepower rating of 7100 and a top speed of 100 mph.

The entire fleet of ALP-46 locomotives should be received by November 2002.

The Central Ohio Transit Authority (COTA) in Columbus, Ohio has received official confirmation from the Federal Transit Administration (FTA) that its proposal for a light rail line has been recommended. The plan includes both a light rail line from Polaris to downtown Columbus and significant increases in bus and paratransit services.

COTA is planning on advertising for preliminary engineering and a Draft Environmental Impact Statement in order to finalize the alignment, station locations, and environmental impact for further funding. Approximately $5.3 million is available for this phase, which is expected to take about two years. If approvals are received in an expeditious manner, COTA hopes to complete final design and construction, and begin revenue service in 2009.

COTA has future expansion plans for seven additional light rail corridors.

The FTA approved the Record of Decision for Seattle's Sound Transit Central Link light rail line. Sound Transit will now start to negotiate with the FTA for a $500 million grant to fund the project

The initial segment of the line will run from downtown Seattle to a station and park-and-ride facility in Tukwila, from which a bus shuttle service will be provided to the Seattle Tacoma International Airport. There will be 11 stations on the line. Service is planned to operate 20 hours per day.

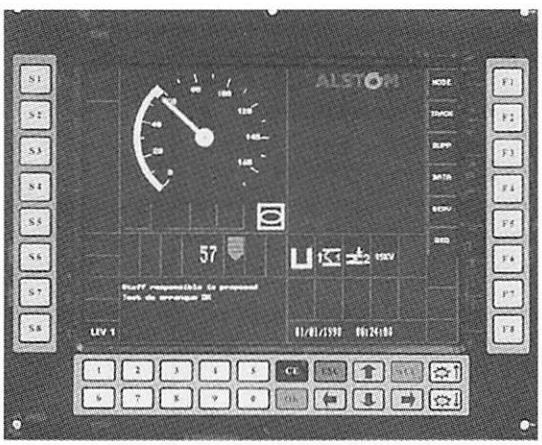
The Central Arkansas Transit Authority (CATA) has signed an agreement with the Arkansas Highway and Transportation Department for the long-term use of the Main Street Bridge. This agreement will allow construction of the 2-mile long electric streetcar line connecting Little Rock to North Little Rock. The line, to be known as River Rail, will use old-style streetcars that are presently being manufactured at the Ida Grove, Iowa plant of Gomaco Inc. Three streetcars are under construction.

Even though both Little Rock and North Little Rock had streetcar lines of their own, when the River Rail opens in 2004 it will be first time that passengers would be able to take a streetcar between the two cities.

The European Rail Traffic Management System (ERTMS) successfully transmitted its first Movement Authority on the French test track in April. This is part of the Level 2 test of ERTMS.

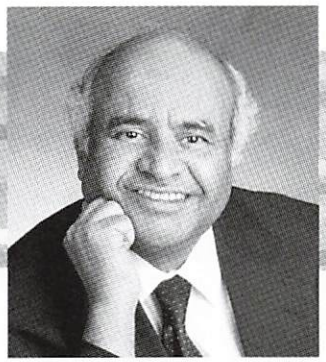
ERTMS comes in three levels: Level 1 is an overlay to the existing signal system. It uses track circuits for train position detection and train integrity (Is the train still in one piece?) detection. Transponders, known as Eurobalises, are located along the wayside to transmit movement authorities to the trains. Level 2 eliminates the need for wayside signals. Train position detection is handled by the Eurobalises. Movement Authorities are transmitted by the radio using the rail version of GSM called GSM-R. Level 3 upgrades Level 2 to a moving block system where the block is determined by the rear of the train ahead and the locations of interlockings. Train integrity is monitored onboard, rather than on the wayside.

The test used wayside equipment supplied by Alstom. The test train used Alstom equipment on one end and Ansaldo equipment on the other end. Both sets of on-board equipment participated in the test of the transmission from the Radio Block Center through the GSM-R radio to the on-board EUROCAB equipment.



Alstom's ERTMS Equipment

The portion of the test track on which the Level 2 demonstration took place is on the high speed line between the Charles de Gaulle Airport and Eurodisney TGV stations.



VTC 2002 Fall Preview

Energize your fall in Spectacular Vancouver, Canada

Vijay K. Bhargava, Conference Chair, University of Victoria

The organizing committee has been working hard and it is a pleasure to provide this preview and to again extend a cordial invitation to you to participate in VTC2002-Fall, which will be held in Vancouver from September 24 through 28, 2002.

Technical Program

The conference has selected 420 papers for presentation in technical sessions and 120 papers for presentation in poster sessions. An international technical program committee of 134 researchers handled the daunting task of selecting these 540 papers from a total of 1140 that were submitted. The conference will focus on most recent developments in OFDM, space time coding, smart antenna, performance analysis, propagation/channel modeling, wireless LAN, Bluetooth and ad-hoc networks, GSM/UMTS/EDGE, MAC design and resource management, interference cancellation and multiuser detection, channel estimation, QoS, wireless location, wideband CDMA, and four sessions devoted to various aspects of **vehicle power and propulsion systems**.

Seventeen half-day tutorials will be presented over the duration of the conference. Mr. Robert Matyas of Nortel Networks has organized a Panel Session on "**Wireless Initiatives and Technologies for Systems Beyond IMT-2000**". Professor Ramjee Prasad of Aalborg University has organized a panel session on "**WLAN, WPAN: IP**".

Immediately prior to the conference, the IEEE International Symposium on Advances in Wireless Communications will be held in Victoria on 22–24 September. Victoria is situated on the southern tip of Vancouver Island, just off the coast from the city of Vancouver. Details about the symposium may be obtained from the website:

http://www.citr.ece.ca/iswc02/

Social Events

Come and join old friends and make new ones during the welcome reception and the conference banquet.

Welcome to Vancouver Reception
You will find hors d'oeuvres and hosted drinks. This reception is open to registered delegates and spouses.

Conference Banquet
The banquet is included in the full registration. Additional tickets may be purchased at a cost of Canadian $150 (US $100).

Award Luncheon
The Awards Luncheon will be at noon Friday, September 27. The Vehicular Technology Society will honour colleagues for their outstanding contributions. This luncheon and lunch on September 25 and 26 are included in the full registration. Additional luncheon tickets may be purchased at a cost of Canadian $60 (US $40).

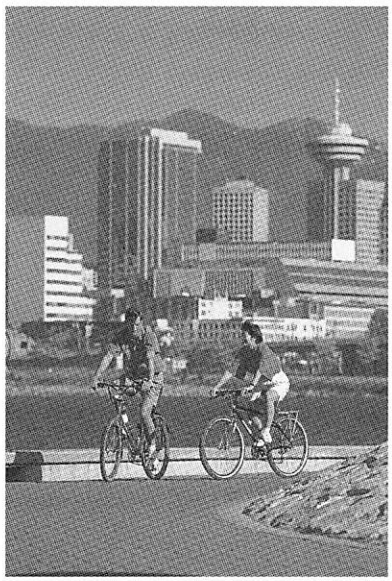
Authors' Breakfast
By invitation, the presenting authors, panelists, and session chairs will meet at breakfast on the day of their sessions. This will enable them to become acquainted and discuss their session arrangements. The breakfast will be served from 7–8 a.m., Wednesday, Thursday and Friday.

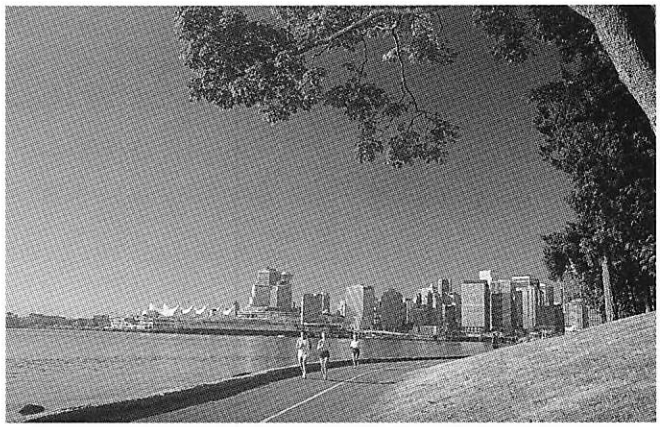
Conference Record
Each registered delegate will receive a conference record (CD-ROM only). If you desire a paper copy, the cost is Canadian $225 (US $150). **You need to reserve and pay for it in advance.**

Companion Activities
A complimentary continental breakfast will be available each morning at 9:00 a.m. in Hyatt Regency Hotel in the Conference Chair suite. The Companion Hospitality Committee Chair, Mrs. Yolande Henri-Bhargava will be pleased to assist you in planning your tour/activities. There are no conference organized tours. However information will be available on regularly scheduled tours.

Internet Access
Internet access will not be available at the conference. However there are several internet cafes within walking distance. It is also available (for a charge) from your hotel room.

Air Access
There are more then 80 direct flights to Vancouver from 22 major cities-comprising 669 flights per week. There are 217 direct flights weekly from 18 cities in Europe and Asia. The Vancouver International Airport is served by over 41 international, national and regional carriers. Transfer service between the airport and the conference hotel (Hyatt Regency) takes about 25 minutes and is available by Airporter Bus ($12 CDN) or Taxi ($25.30 CDN).





Vancouver Climate
Warmed by the ocean currents and protected by mountains, Vancouver enjoy relatively mild temperature year around. The average high temperature in September is 16°C with an average of 18 days without rain.

Tutorials

During the conference

T1 **Insights on OFDM Technology, Applications and Research Issues**, Hlaing Minn, University of Texas, USA (Wed., 25 Sept. AM)

T2 **MULTIUSER DETECTION Advanced Signal Processing for Wireless Systems**, H. Vincent Poor, Princeton University, USA (Thu., 26 Sept. AM)

T3 **Space-Time Coding**, Vahid Tarokh, Harvard University, USA (Thu., 26 Sept. PM)

T4 **Wireless Personal Area Networks (WPAN)**, Liljana Gavriloska and Ramjee Prasad, Aalborg University, Denmark (Fri., 27 Sept. AM.)

T5 **Third Generation (3G) Cellular Systems: Features and Enhancements**, Uma Jha, Airify Communications, USA (Fri., 27 Sept. PM.)

Saturday, 28 September AM Tutorials

T6 **The GSM Evolution (GSM/GPRS/EDGE) – Traffic Engineering for Packet Data Service**s, Peter Stuckmann, Aachen University of Technology, Germany.

T7 **Hybrid Vehicle Architectures and Voltage Level**, John M. Miller, Ford Motor Co., and Mark Ehsani, Texas A&M University, USA.

T8 **Joint Physical and Network Layer Optimization of Wireless Systems: Smart Antennas, Turbo Coding, Space-Time Coding, Adaptive Transceivers and 'all that' for Improved QoS**, Lajos Hanzo, University of Southampton, UK.

T9 **Wireless Internet: Issues in Protocols and Architectures and Enabling Technologies**, Ekram Hossain, University of Manitoba, Canada.

T10 **Wideband Multiantenna Wireless Channels: Statistical Modeling, Analysis and Simulation**, Venugopal Veeravalli, University of Illinois at Urbana-Champaign and Akbar M. Sayeed, University of Wisconsin-Madison, USA.

Conference Registration

www.fallvtc2002.org

Vancouver, BC, Canada 24–28 September 2002

VTC2002-Fall VANCOUVER
Pathway to Ubiquitous Wireless Communications

To Register: Send Fax to +1 250 721 6048, FOR FASTEST CONFIRMATION
MAIL: Catherine Chang, Dept. of Elec. & Comp. Eng., University of Victoria; PO Box 3055, STN CSC; Victoria, BC, Canada V8W 3P6
EMAIL: cathy@ece.uvic.ca • **PHONE**: +1 250 721 8924 (for questions only; no registration by phone, please)

1. Please Print All Information

First (given) Name | Last(family/surname) Name | Badge/Nickname

Company/Organization Name | Street | Mail Stop

City | State/Province | Zip/Postal Code | Country

E-mail Address | Phone Number | Fax Number

I am a ☐ paper author ☐ paper presenter/paper number _____ **(Authors must supply this information)**

2. Conference Registration Fee (All amounts are in Canadian Dollars)

R01	FULL MEMBER: IEEE Member Number _____	CAN $865	CAN $ _____
R02	FULL NON MEMBER[1]	CAN $1015	CAN $ _____
R03	STUDENT MEMBER[2]: (Proof of full time status required)	CAN $300	CAN $
R04	STUDENT NON MEMBER (Proof of full time status required)	CAN $375	CAN $ _____
R05	LIFE MEMBER	CAN $300	CAN $ _____

[1]Full registration includes: Welcome reception, three lunches, conference banquet, conference record (CD-ROM) and admission to all sessions.
[2]Student and Life Member registration includes: Welcome reception, conference record (CD-ROM) and admission to all sessions.

3. Tutorial Registration

If it is necessary to cancel a tutorial, liability of VTC 2000-Fall is limited to return of tutorial fee (see website for tutorial details).

Please check all Tutorial Sessions you plan to attend. Select only one for each time period.

Wednesday, 25 September	AM Tutorial	☐ T1									
Thursday, 26 September	AM Tutorial	☐ T2			PM Tutorial	☐ T3					
Friday, 27 September	AM Tutorial	☐ T4			PM Tutorial	☐ T5					
Saturday, 28 September	AM Tutorial	☐ T6	☐ T7	☐ T8	☐ T9	☐ T10	☐ T11				
Saturday, 28 September	PM Tutorial	☐ T12	☐ T13	☐ T14	☐ T15	☐ T16	☐ T17				

Tutorial (per tutorial)	CAN $340	# Tutorials _____	CAN $	_____
Student or Life Member (per tutorial)	CAN $225	# Tutorials _____	CAN $	_____

Conference record (paper only) - Limited availability, **(Must reserve in advance)**	CAN $225	# ____	CAN $	_____
Conference Banquet (26 September)	CAN $150	# ____	CAN $	_____
Award Luncheon (27 September)	CAN $60	# ____	CAN $	_____

5. Conference Payment

Total 2 + 3 + 4 = CAN $_____

☐ Payment enclosed. Check or Money order made out to **IEEE VTC 2002 Fall** (Canadian. Dollars, drawn on a Canadian bank)

☐ Charge to my: ☐ VISA ☐ MasterCard Expiration Date (Month/Year) _____

Card Number | | | | | | | | | | | | | | | | | | | | |

Signature Date

Cancellation Refund Policy: No refund for cancellation after 23 July 2002. There is a $50 fee for cancellation before that date. All registration cancellations must be received in writing or via email. **"No shows" will not receive a refund.**

T11 **Digital Communications over Generalized Fading Channels: A Unified Approach to Performance Analysis**, Marvin K. Simon, CALTECH/JPL and Mohamed-Slim Alouini, University of Minnesota, USA.

Saturday, 28 September PM Tutorials

T12 **Resource Management in Wireless Networks**, Abraham Fapojuwo, University of Calgary, Canada.

T13 **Practical Consideration in the Design of Antennas for Wireless Communication**, Tuli Herscovici, Spike Broadband Systems, USA.

T14 **Interference Analysis and Mitigation Techniques for Wireless Communications**, Peter Stavroulakis, Technical University of Crete, Greece.

T15 **Multidimensional Channel Sounding Techniques and Their Applications to Performance Evaluation of Radio Access Techniques for Broadband Mobile Communications**, Reiner Thoma, IUT Germany, Uwe Trautwein, TewiSoft GmbH, Germany and Tadashi Matsumoto, NTT DoCoMo Japan/Oulu University , Finland.

T16 **Coordinated Multiuser Communications**, Alex Grant, University of South Australia, Australia and Christian Schlegel, University of Alberta, Canada.

T17 **Wireless IP**, Ramjee Prasad, Aalborg University, Denmark and Luis Muñoz, University of Cantabria, Spain

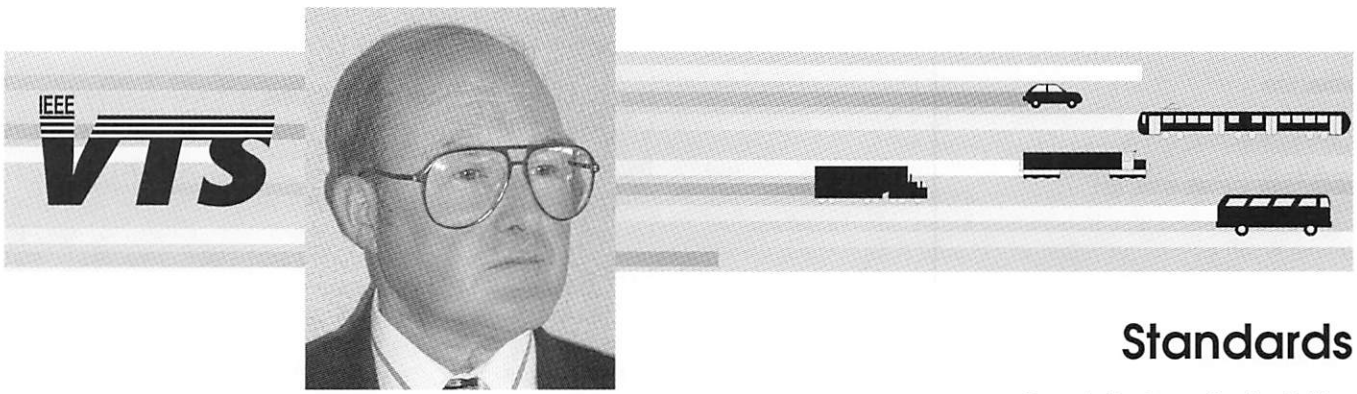
For More Information

For further information please contact:

- **Vijay Bhargava**, Conference Chair
  E-mail: v.bhargava@ieee.org
- **Annamalai Annamalai Jr.**, Technical Program Chair
  E-mail: annamala@vt.edu
- **Catherine Chang**, Conference Secretariat
  E-mail: cathy@ece.uvic.ca
  Telephone: +1 250 721 8924

Program Changes/Web Address

There will be some changes to the program as planning continues. These will be posted on the conference website **http://www.fallvtc2002.org**



Standards

Dennis Bodson, Senior Editor

New Chairman for the IEEE Vehicular Technology Society Rail Transit Vehicle Interface Standards Committee

Dr. J. R. Cruz, President, Vehicular Technology Society (VTS), has appointed James H. Dietz to succeed Tom McGean as the new chair of the IEEE VTS Rail Transit Vehicle Interface Standards Committee effective April 3, 2002. Mr. McGean has chaired this committee with distinction for the past five years and wished to turn over the reins to a new chairman.

Satellite Radio Stations' Complaints Could Force FCC to Limit Wi-Fi

Wireless Internet access was all the rage at the annual PC Forum gathering held in Scottsdale, Arizona at the end of March. High-tech gurus surfed the Web from untethered laptops while entrepreneurs touted new wireless business plans. However, there are troubles on the horizon.

The problem concerns the widely used wireless technology known as 802.11b, or Wi-Fi. Satellite-radio operators complain that Wi-Fi connections could interfere with their services, and they want the Federal Communications Commission to impose new restrictions on the technology.

That could kill the wireless revolution before it gets started. If Wi-Fi equipment makers are forced back to the drawing board, plans for pervasive wireless Internet access in urban areas could evaporate. Start-ups that have embraced Wi-Fi, such as Sky Dayton's Boingo Wireless, would be out of business.

This debate will serve as a litmus test for the FCC's program to deregulate high-speed broadband Internet access. The Commission wants to loosen constraints on cable and telephone companies, but if the goal is real competition, and not a cable-phone duopoly in broadband, they must not hamstring Wi-Fi and other wireless technologies.

To understand what's at stake in the wireless world, look no further than Joltage, a new 802.11b start-up that held its coming out at PC Forum. Before a standing-room-only audience, Joltage executives described an ambitious plan to develop a global wireless Internet network – with the help of small businesses and individual Net users.

The Joltage plan is a wireless franchise operation practically anyone can join. All it takes is a high-speed Internet connection and a few hundred dollars worth of Wi-Fi gear. Would-be network members – a coffee shop, say, or a bookstore – download and install special software. The program links the location to the Joltage network.

A laptop user with an 802.11b card and a Joltage account can then visit the location, boot up, sign on and get online. A Joltage account costs $1.99 an hour, or $24.99 a month for up to 60 hours of access.

For the user, the experience is similar to other Wi-Fi networks already in operation. The interesting thing here is the pitch to potential network franchisees, which get a cut of revenue whenever a Joltage member signs on at their locations. For anyone with a high-speed Net connection and a wireless access point, joining Joltage could prove an easy way to defray the cost of the connection, and maybe even make some money.

In other words, Joltage is creating an incentive for thousands of small businesses to install a broadband connection. That is great for broadband companies that bemoan a lack of demand for their services, and for business users and consumers who want to tap the Internet no matter where they go.

The concern is if the government changes the rules for Wi-Fi. Manufacturers would need to redesign their wireless equipment, driving up costs, reducing availability and potentially cutting the range of Wi-Fi. Companies like Joltage, which hope to offer pervasive public Internet access, could be stalled.

That is exactly what could happen if the FCC buys into the arguments of satellite-radio providers. Sirius Satellite Radio (*see VTS News, February 2001)* and XM Satellite Radio have both asked the FCC to clamp down on Wi-Fi and other wireless technologies. These companies offer new satellite-radio services that provide clear, commercial-free radio broadcasts almost anywhere for a monthly fee.

The broadcasts operate on a different frequency from Wi-Fi, but the frequencies are so close to each other that the satellite providers say energy can leak over from Wi-Fi devices and interfere with satellite radio. They want the FCC to set limits on these out-of-band emissions.

The satellite companies say they aren't trying to shut down Wi-Fi. "I think wireless devices are going to blossom," says Sirius co-founder Robert Briskman. Mr. Briskman believes Wi-Fi-device manufacturers could reduce the interference by installing filters and making other changes to wireless transmitters. Wi-Fi advocates reply that their systems were designed to meet the FCC's current rules – so if satellite providers have a problem, they should fix their own systems.

Static is obviously a bad thing in the radio business. But satellite providers may face future competition from Wi-Fi. After all, Internet radio broadcasters offer thousands of high-quality digital-music streams for users connected over broadband. If wireless networks give users that kind of access outside their homes, subscription-based satellite radio might not seem so attractive.

FCC Chairman Michael Powell, who appeared at PC Forum, wouldn't comment specifically on the satellite proposals. Many came away encouraged when he proclaimed, "I love 802.11." But Mr. Powell also cautioned that heavy usage of Wi-Fi and other devices that use unlicensed frequencies could eventually produce a "meltdown."

IEEE-SA Standards Board Approves a Project Authorization Request (PAR) for a New Rail Transit Standard

The IEEE-SA Standards Board (IEEE-SASB) on 21 March 2002 approved a new PAR for P1612 (VT/RT) Standard for Wireless Transport of Non-Train-Control It can be found at http://grouper.ieee.org/board/nescom/1612.pdf Data between Rail Transit Vehicle and Wayside Systems. This standard will define the protocols that constitute a suite of communication services for use in the transport on non-train control data between the rail transit vehicle and wayside systems.

This standard is needed to enable wireless communications between rail transit vehicles and wayside systems to share common communications services while reducing development cycle time and risk. Vehicle wiring and weight can be reduced through the elimination of redundant transmitters and receivers, with resulting improvements in systems integration, reliability, and maintainability. In addition, rail vehicle operation cab be more tightly integrated with overall transit system operation through the availability, both on the vehicle and at the wayside, of timely information regarding vehicle and off-vehicle system status.

New PARS for VTS Standards

The IEEE-SASB New Standards Committee (NesCom) will consider the following new PARS for VT standards at their next meeting:

- P1626 (VT/RT) Standard for dc Overhead Contact System Insulation Requirements
- P1627 (VT/RT) Standard for Grounding Practices for dc Electrification Overhead Contact Systems Including Application of Lightning Arrestors
- P1628 (VT/RT) Recommended Practice for Maintenance for Overhead Contact Systems for Transit
- P1629 (VT/RT) Standard for Performance of Overhead Current Collectors for Transit Vehicles
- P1630 (VT/RT) Standard for Supporting Structures for Overhead Contact Systems for Rail Transit

The NesCom meeting will take place on June 12, 2002 in Piscataway, NJ at the IEEE Operations Center.

IEEE Approves IEEE 802.15.1 Standard for Wireless Personal Area Networks Adapted from the BLUETOOTH® Specification

The Standards Board of the Institute of Electrical and Electronics Engineers Standards Association (IEEE-SA) has approved the IEEE Standard 802.15.1 ("Wireless MAC and PHY Specifications for Wireless Personal Area Networks (WPANs™)", which is adapted from portions of the Bluetooth™ wireless specification.

IEEE licensed wireless technology from the Bluetooth SIG, Inc., to adapt and copy a portion of the Bluetooth specification as base material for IEEE Standard 802.15.1-2002. The approved IEEE 802.15.1 standard is fully compatible with the Bluetooth v1.1 specification. Bluetooth technology defines specifications for small-form-factor, low-cost wireless radio communications among notebook computers, personal digital assistants, cellular phones and other portable, handheld devices, and connectivity to the Internet.

"The new standard gives the Bluetooth spec greater validity and support in the market and is an additional resource for those who implement Bluetooth devices," says Ian Gifford, IEEE 802.15 Working Group Vice Chair. "This collaboration is a good example of how a standards development organization and a special industry group (SIG) can work together to improve an industry specification and also create a standard. "Under the agreement between the two, the IEEE brought together a great many experts from around the world to scrutinize and enhance the Bluetooth specification. We received thousands of comments, and the Bluetooth SIG applied more than 300 of them to the original Bluetooth spec."

The IEEE 802.15 Working Group (see http://ieee802.org/15/ for details) is part of the IEEE 802® LAN/MAN Standards Committee, and develops Personal Area Network consensus standards for short distance wireless networks; a.k.a. WPANs™ These WPANs address wireless networking of portable and mobile computing devices such as PCs, Personal Digital Assistants (PDAs), peripherals, cell

phones, pagers, and consumer electronics; allowing these devices to communicate and interoperate with one another.

In speaking about the collaboration, Tom Siep, General Manager, Bluetooth SIG, Inc., says: "The peer review process the IEEE-SA brought to bear in standardizing the lower layers of our specification was an invaluable service; it created many changes and additions that improved the overall document. We appreciate our ongoing relationship with the IEEE-SA."

The IEEE standard also added a major clause on Service Access Points, which includes an LLC/MAC interface for the ISO/IEC 8802-2 LLC, a normative annex that provides a protocol implementation conformance statement (PICS) pro forma, and an informative, high-level behavioral ITU-T Z.100 specification and description language (SDL) model for an integrated Bluetooth MAC Sublayer. This SDL model offers an extensive overview (more than 500 pages long) of a significant portion of the Bluetooth protocols e.g., Baseband, LMP, L2CAP, and the Link Manager (using the host controller interface (HCI)).

The IEEE-SA also plans to further develop the 802.15.1 SDL model source to support the standard. The SDL code, which will be available on CD-ROM, will include a computer model for use with any SDL tool that supports the SDL-88, SDL-92 or SDL-2000 update of ITU-T Recommendation Z.100. The IEEE 802.15.1 Working Task Group used the SDL to translate the natural language of the Bluetooth Specification into a formal specification that defines how the Bluetooth protocols react to events in the environment that are communicated to a system by signals.

ETSI Approves HIPERACCESS Core Standards for Broadband Fixed Wireless Access

ETSI Project Broadband Radio Access Networks (EP BRAN) has approved the core technical specifications (i.e. the specifications for the Physical (PHY) Layer and for the Data Link Control (DLC) Layer) for the High Performance Radio Access (HIPERACCESS) standard. The development of the convergence layer for support of different core networks, such as Internet Protocol (IP), Ethernet and Asynchronous Transfer Mode (ATM), will be completed later this year.

HIPERACCESS is an interoperable standard tailored to give broadband access to both the home and small- and medium-sized enterprises, as well as to provide backhaul for mobile systems (e.g. the Universal Mobile Telecommunications System (UMTS™) and the General Packet Radio Service (GPRS)). HIPERACCESS is a truly broadband system, and supports bit rates of up to approximately 100 Mbit/s.

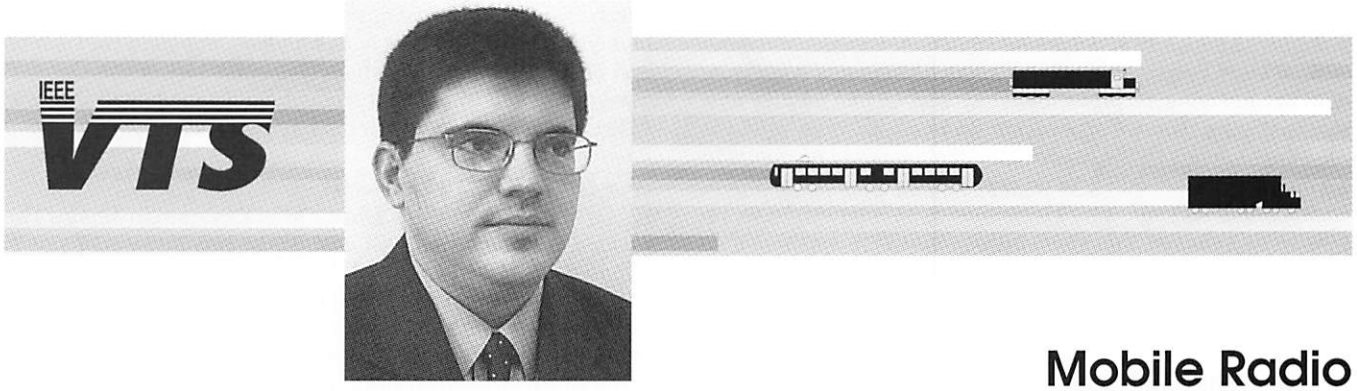
Mr Jamshid Khun-Jush, Chairman of ETSI Project BRAN, comments: 'The completion of this standard marks a significant milestone in the development of Broadband Fixed Wireless Access. This gives network operators an important tool to offer broadband IP and multimedia services to their customers.'

To ensure the interoperability of HIPERACCESS implementations, the DLC protocol specification is detailed and precise. The key component is the specification of protocol messages in Abstract Syntax Notation 1 (ASN.1). The use of ASN.1 increases the productivity and precision of product development and facilitates future upgrades, allowing even the different protocol versions to interoperate. The behaviour specification is given in Specification and Description Language (SDL) models covering more complex protocol aspects. The correctness of the models has been validated with appropriate tools. The .../... 2 models allow for simulations that generate graphical protocol traces. The SDL model can even be seen as a reference implementation of the protocol. To further ensure the interoperability of devices and products produced by different vendors, ETSI Project BRAN is currently developing conformance test specifications, including both radio and protocol testing, which will be completed later this year.

The HIPERACCESS PHY specification (ETSI TR 101 999) is already available on the ETSI web site at http://portal.etsi.org/Portal_Common/home.asp, where the HIPERACCESS system overview (ETSI TR 102 003) can also be found. The DLC specification will be available at the end of this month.

References

1. Thomas E. Weber, Walls Street Journal, E-World, April 1, 2002.
2. Sophia-Antipolis, Grance, ETSI Press Release, May 17, 2002.



Mobile Radio

Javier Gozalvez, Senior Editor

CTIA Wireless 2002

The CTIA Wireless 2002 trade show took place in Orlando between the 18th and 20th of March. The theme of the event was "Wireless Lifestyles" representing the next evolution of the wireless industry. The event included over a thousand exhibitors and there were about 25,000 attendees, according to Statlistics Inc, CTIA's list broker. Four special interest seminars supplemented the event: the Latin American Conference; Telematics Update; Andrew Seybold's Wireless Data University; and the Wireless Developer Network Technical Day. Also, special interest pavilions, such as Homeland Security, Telematics, Healthcare, Enterprise

and Home RF, were included in the show. The trade show also included the event "Fashion in Motion", the premier showcase for wearable wireless and Internet technology.

One of the main subjects of interest in the event was the roaming between different Wireless LAN standards and between Wireless LANs and cellular networks. According to John Stanton, chairman of US GSM operator VoiceStream, "Wi-Fi is a threat and an opportunity". Mr Stanton also said that the VoiceStream vision involved "three clouds of coverage". The first is WLAN networks in hot spots for stationary usage. The second one is EDGE, which will be deployed in 2003 in central cities, and the third one is GPRS which will be "essentially ubiquitous" across the US. He also said that its company devices will be EDGE capable next year, and most of them will also be WiFi capable. VoiceStream previously bought the assets of MobileStart, a provider of Wi-Fi technology. GoAmerica also announced that it will expand its corporate service to include WLANs as well as its CDPD and Mobitex networks. Padcom launched a new client-server software allowing end users to seamlessly roam between different network types (CDPD, cellular, WLAN) and ensuring security via built-in VPN technology.

Qualcomm was also present at the event and some of their products and solutions showcased included: live UMTS/WCDMA and GSM calls using small form factor handsets; live demonstrations of GSM1x, gpsOne position location technology and Compact Media Extension multimedia software; 13 developers and publishers demonstrating their applications on the Binary Runtime Environment for Wireless platform. Nokia showcased 11 new products incorporating the latest wireless technologies. Included were two dual-band GSM/GPRS 850/1900MHz handsets, two CDMA2000 1X phones, a combination GPRS/802.11b wireless LAN PC card, the world's first GAIT compliant handset (the Nokia 6340 phone) and a new machine-to-machine (M2M) terminal and gateway. The Nokia 31 M2M solution allows business to wirelessly stayed connected with a wide variety of equipment. Maintenance, security and restocking activities can be streamlined using this M2M solution. e-tenna Corp. unveiled a low-cost, low-profile antenna, ClearLink 2400, for 802.11b wireless LAN and Bluetooth personal area networking applications. The product is available for integration in 2.4GHz wireless devices and enables Bluetooth and Wi-Fi module manufacturers to create a single antenna that works on multiple devices. Wireless Online launched its ClearBeam 1800/1900 Smart Applique, a smart antenna solution for GSM and GPRS mobile networks. Space Data Corporation showed its high-altitude SkySite balloons that can provide wireless coverage for 24 to 48 hours before needing to be replaced by the next balloon, which are biodegradable. The company is scheduling to deploy their solution this year. Superconductor Technologies presented their high-temperature SuperFilters used on cellular towers to enhance network performance, save energy and increase signal sensitivity.

Verizon Wireless announced during the event that it will be conducting two CDMA2000 1XEV-DO trials in the US this year; the first one is to take place in Washington DC, the second in San Diego. The operator also announced the availability of BREW-enabled services for wireless applications, becoming the first US operator and the second internationally to debut BREW.

During one of the keynote speeches, Korea Telecom Freetel President, Mr Lee, told attendees that 30-35% of their customer base are using wireless internet of which 50% of those are 20 years or below. The company's CDMA2000 1X users use 250-300 minutes a month while 2G users only use 150 minutes per month. KTF's CDMA2000 1X service has been on the market for just eight months and they already have 1.3million customers. However, m-commerce is only a small portion of the total revenue and data represents 10% of total revenues. A novel and very successful service introduced by KTF is the possibility of getting an advert instead of a ring tone, paying 3 cents less per call or saving 6% on their total monthly bill. According to Mr Lee, the service has been so popular that the company had to expand the system.

More information on the CTIA Wireless 2002 event can be found at: http://wireless2002.ctsg.com and http://www.wow-com.com/

CeBIT 2002

The CeBIT 2002 trade fair took place in Hannover between the 13th and 20th of March. Vodafone and T-Mobile announced they have teamed up to launch a mobile payment platform towards the end of this year. Both operators account for 80% of the mobile market in Germany and 50% in the UK. The two operators hope other operators will join their platform. Deutsche Telekom and Microsoft also announced their alliance to offer mobile services to corporate customers. The services will centre on mobile access to corporate networks and emails through mobile phones, PDAs and laptop computers.

Nokia unveiled five new handsets, incorporating Java, Bluetooth, and MMS capabilities. Some of the handsets also support GPRS and HSCSD. Nokia also maintained it was targeting the third quarter of 2002 for the launch of its first dual-mode GSM/WCDMA handsets. Siemens also indicated it would launch its dual-mode 3G phones in the fourth quarter of 2002. The German manufacturer also expects the mobile handset sales to increase to a total sale for 2002 of about 420million after the decrease experienced in 2001. Sharp introduced at the fair its Linux-based PDA called Zaurus. Additional cards for WLAN, Bluetooth and GSM/GPRS access will also soon be available. Andrew Corporation introduced the Cell-Max Dual Band Directional Antennas for extending wireless coverage in areas of weak RF signal reception such as office buildings, parking garages, and tunnels. The antennas can also be used in high traffic microcell applications. They are available in the 824-960MHz and 1710-2170MHz frequency bands. E-Plus, a German mobile operator, announced it will launch its i-mode system with handsets supplied by Toshiba and NEC. The operator, who has around 14% of the German market, expects that the introduction of i-mode will increase ARPUs by 25-30% over the next 12 months.

3G Trials and Roll-Out

KDDI has launched its CDMA2000 1X system in Japan. The service, branded "au", will initially be available in 33 out of Japan's 47 prefectures and 477 municipalities throughout the country, covering 70% of Japan's population. The services include data access at speeds up to 144kbps, GPS, video capabilities and digital cameras. The company expects to attract seven million subscribers by March 2003. After 30 days, KDDI had signed 334,000 subscribers to its CDMA2000 1X service. On the other hand, J-Phone has further delayed the launch of its 3G service, based on the WCDMA standard, from June to December.

Korea Telecom has launched its 3G CDMA2000 1XEV-DO service called "fimm-First In Mobile MultiMedia". The service was commercially launched in the Seoul district on 10th May 2002 and will expand to other areas in the near future. Alcatel has opened its 3G Reality Centre in

Taipei, becoming the first fully functional 3G/UMTS system in Taiwan, according to the operator. The 3G Reality Centre offers Alcatel and its partners, including local content and applications providers, a live and comprehensive end-to-end environment for the development and testing of advanced mobile applications and data services, in the field of 2.5G/GPRS and 3G/UMTS.

AT&T Wireless and Ericsson will deploy in the US a UMTS/WCDMA market trial system in the fourth quarter of 2002. This UMTS/WCDMA market trial system, which will have about 100 cell sites in the Dallas area, will be the first 1900MHz UMTS/WCDMA system in the Americas. Centennial de Puerto Rico has commercially launched its CDMA2000 1X network in Puerto Rico.

The Swedish Competition Authority has announced that it has approved the 3G network-sharing agreement between the mobile operators, Telia and Tele2, in the Swedish market. The decision is an exemption and is valid for only five years. The Russia's Telecoms Ministry has approved the IMT-MC (CDMA2000) standard for use in the country. Delta Telecom and Moscow Cellular Communications have already been granted CDMA licenses for their markets. Poland's telecoms regulator, URTiP, has agreed to delay the launch of UMTS mobile services by one year until the start of 2005.

EUROCONTROL, the European Organisation for the Safety of Air Navigation, and Roke Manor Research have successfully completed 3G communication trials, involving QinetiQ's BAC-11 research aircraft. The trials included live video of activities in the cockpit and cabin that were relayed to the ground station along with still photographs. Simultaneously, a voice call was made while a passenger on the aircraft browsed the web and watched a video selected and streamed from a server on the ground.

FCC & US mobile market

The Federal Communications Commission (FCC) has issued a Public Notice postponing Auction No. 31, which consists of spectrum licenses in the 747-762MHz and 777-792MHz bands (upper 700MHz band) until January 14, 2003. The FCC delayed the auction in order to provide additional time for Congress to consider legislation affecting the timing of that auction and, accordingly, bidder preparation and planning. The FCC also stated that Auction No.44, which consists of spectrum licenses in the 698-746MHz band (lower 700MHz) will proceed as scheduled beginning on June 19, 2002.

The FCC has announced it will refund a substantial portion of down payments made by winning bidders in Auction No.35 for licenses previously issued to NextWave Personal Communications Inc, NextWave Power Partners Inc and Urban Comm-North Carolina Inc. The FCC will return approximately $2.8billion, or 85%, of the down payments currently held. The Commission will maintain the pending status of the applications for these licenses.

The FCC adopted a Notice of Proposed Rulemaking seeking comment on how to improve the rural health care universal service mechanism, which helps rural health care providers obtain access to modern telecommunications and information services for medical and health maintenance purposes. In particular, the Commission seeks comments on general issues including eligible health care providers, eligible services and calculation of discounted services.

FCC's Chairman, Mr Michael K. Powell, has announced the formation of a Spectrum Policy Task Force to assist the Commission in identifying and evaluating changes in spectrum policy that will increase the public benefits derived from the use of radio spectrum. For more information visit the web site www.fcc.gov/SPTF

The FCC has adopted a Report and Order implementing new service rules governing a total of 27MHz in seven spectrum bands. The bands impacted by the Commission's action are the 216-220MHz, 1390-1395MHz, 1427-1429.5MHz, 1429.5-1432MHz, 1432-1435MHz, 1670-1675MHz and 2385-2390MHz bands. These bands have been reallocated for non-government use. The adopted rules establish a flexible regulatory and licensing framework. Full details of the actions can be find at www.fcc.gov

The National Communications System, which co-ordinates some US emergency communications, has unveiled they are conducting a pilot program with VoiceStream for wireless priority services. The program will be put in place in New York and Washington DC. The program will allow national security and emergency personnel to use mobile phones to speed calls through overloaded wireless and landline networks. The system would always be available using a pre-programmed chip in the handsets until commercial handsets are available. Sony Ericsson will manufacture the handsets.

According to a CTIA survey, Americans used about 456billion minutes on their mobile phones last year, up 76% over 2000, as revenue jumped 24% to $65billion. The average monthly minutes of use rose to 385 minutes from 266 minutes (47%) and the average monthly bill rose just 4.6% to $47.37 from $45.27. The revenue from wireless data services more than doubled over the last year reaching $545million from $211.2million the previous year. The number of mobile telephone subscribers in the US increased to 128.4million last year from 109million. The number of cell sites also increased from 104,288 to 127,540 (22.3%). According to a report published by TIA, the US mobile industry will be worth $116billion in 2002, including $87.6billion spent on services. The total figure represents an increase of 8.5% compared to 2001. The report also predicts that the revenue from wireless services will reach $130billion in 2005. Research published by Strategy Analytics expects the US penetration rate to reach 51% by the end of the year versus 46% at the end of 2001. The report confirms Verizon Wireless lead with 22% market share followed by Cingular with 16% and AT&T with 14%. The research also says that the total number of handset sales in the US this year will reach 81million with replacements accounting for 50% of those sales.

Mobile Satellite Communications

The FCC has adopted a flexible, innovative and efficient spectrum sharing approach that relies on market demands to shape service offerings. The action affects data, video and telephony services to businesses, governments and individuals. The Commission adopted a Report and Order for licensing new satellite services in shared Ku-band frequencies (10.7GHz-14.5GHz). The Order creates a sharing method for the systems to simultaneously operate in shared spectrum most of the time, even while using different satellite designs. Under the adopted approach, the systems involved will split the frequency band for the duration of the event.

EU transport ministers gave the go-ahead to the EU's Galileo satellite navigation project. The system is planned to have 30 satellites in orbit by 2008. Two thirds of the overall cost of Galileo are expected to be covered by the private sector and a consortium of eight companies has been formed to exploit commercial aspects of the project, including marine navigation and information links for mobile phones.

Inmarsat Ltd has launched Swift64, a new service that will allow aircraft passengers to access Internet services at a speed of 64kbps.

Mobile Phones and Health Concerns

The Food and Drug Administration (FDA) and the FCC have established a joint web site, Cell Phone Facts (www.fcc.gov/cellphones), to provide consumer information regarding cellular phones and radio frequency energy. This web site provides the public with information from both government agencies involved in the regulation of cell phones and their base stations. It provides a review of how cell phones work and answers questions raised about their safety. The site observes that while no scientific evidence has been published demonstrating harm from short-term exposures to low levels of RF energy, studies are now underway to look at the possible risks of long-term exposures. The results of any such studies will also be published on the web site.

Research conducted in Japan has shown that the electromagnetic field resulting from the use of mobile phones in trains can exceed the maximum exposure level recommended by the International Committee for Non-Ionising Radiation. The study showed that in a standard train carriage carrying 151 people the radiation levels would exceed the committee's exposure limits if 30 people at the same time used mobile phones emitting radio waves at a power of 0.4 watts.

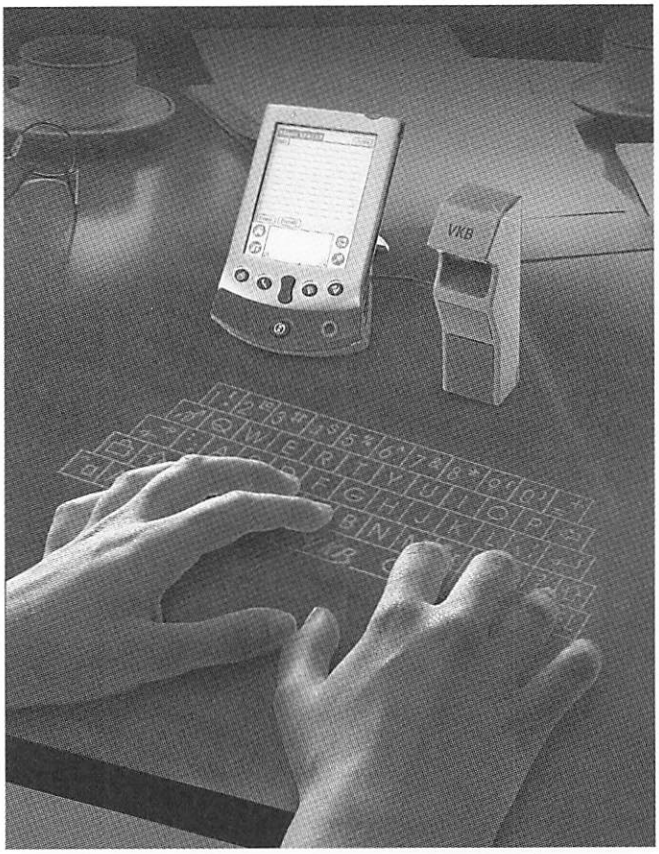
The UK Government has published a report into the effectiveness of various types of mobile phone radiation shields. The report shows that mobile shields and devices can significantly reduce mobile phone exposure for the user but usually at the cost of inhibiting the phone's performance. Absorbing devices known as "buttons" do not reduce mobile phone exposure for the user in the standard exposure tests. The report also noted that personal hands-free kits remain one of the best approaches for reducing exposure of mobile phone radiation to the head.

INFORM Inc has released a study, titled "Waste in the Wireless World: The Challenge of Cell Phones", examining the effects of what it says will be 130million discarded mobile phones in the US by the end of 2005. The research indicates that those 130million phones will represent 65,000 tons of waste including hazardous chemicals as well as plastic and flame retardants. The European Parliament has approved a law that will make manufacturers of electrical and electronic goods in the European Union pay for the recycling of their old products. Under the rules, electronics firms will have to pay for the collecting and recycling of scrap. The law has now to be approved by EU governments.

Technology and Research News

General Dynamics has revealed its Type 1 Sectera Secure Wireless Phone for GSM systems, a handset that can, according to the company, handle the stringent security expectations of top government officials. The phone, which consists of a clip-in module designed for use with the Motorola Timeport, operates over commercial or private GSM systems in the 900, 1800 and 1900 MHz GSM bands. According to the company, the National Security Agency has certified the phone's ability to protect classified information up to the so-called "Top Secret" level.

Siemens has announced it will distribute in Germany the "Virtual Keyboard" developed by VKB Inc. The device projects the image of a computer keyboard onto any flat surface and makes it easy to enter text on a mobile phone, PDA or PC. An infrared system senses the letters and numbers typed by the user and communicates them by wire or radio



The VKB Virtual Keyboard distributed by Siemens

to the PDA, mobile phone or PC. The device is based on a chipset that will also be easy to integrate directly into PDAs and mobile phones. The "Virtual Keyboard" should be commercially available from the fall of 2002.

The Pentagon is working with researchers to develop live remoted-controlled rats that could eventually be used to detect land mines and find people trapped in collapsed buildings. The research of State University of New York's Dr John Chapin uses small electronic probes placed in specific sites on the brains of rats with wireless links to controls to determine movement and direction. The researcher's signal, from up to 1,600 feet away, stimulates the part of the rat's brain that normally receives sensations from the animal' whiskers, which rats use to navigate. When it responds properly, the rat is rewarded with a signal that stimulates the pleasure centre of its brain. The scientists are looking at possible linkup with GPS on the rats.

The UMTS Forum has released a new report "IMS Service Vision for 3G Markets" explaining the "IP Multimedia Subsystem" (IMS) concept and illustrating its vital role in the 3G end-user experience as well as the benefits it offers to mobile operators. The report is available from the UMTS Forum web site (http://www.umts-forum.org/). IMS will enable the handling of smooth integration between mobile and internet networks with tomorrow's rich service environment. The report presents a compelling vision of IMS that includes interoperability between fixed and mobile IP networks that will further the possibility of a seamless end-user experience across services, networks and devices.

Cingular Wireless has conducted the first GSM call using 850MHz spectrum in the field. The call was made in May 8th in the Detroit area. Cingular Wireless is overlaying its TDMA network with GSM, converting systems running on both 850MHz and 1900MHz as well as analogue networks

using the 850MHz frequency. At the moment, there are over 89million AMPS and TDMA subscribers worldwide in the 850MHz spectrum only and an additional 45million subscribers on dual-band 850-1900MHz networks.

Effnet has completed the first comprehensive study that analyses the impact of IP Header Compression on the cost of deploying 2.5G and 3G mobile phone networks. The Header Compression software is expected to save mobile operators up to $15billion in reduced infrastructure cost through the end of 2005 if the total investments are $100billion. For some types of IP traffic, the Header Compression technologies can save as much as 75% of the required bandwidth. By implementing Robust Header Compression mobile operators can reduce IP headers to less than 1% of the total IP user traffic by 2005. Ericsson has recently hosted a Robust Header Compression interoperability test in Sweden. The test was conducted together with Nokia, Siemens/Roke Manor Research, Effnet and Panasonic. The test covered the robustness over emulated WCDMA/3G links.

The CDMA Development Group has reported that CDMA2000 1xEV-DV (data and voice) has been approved by both the 3GPP2 and TIA for publication, and has been submitted to the ITU for formal approval as an IMT-2000 3G global standard. As specified by the 3GPP2, CDMA2000 1xEV-DV will provide integrated voice with simultaneous high-speed packet data services, such as video, video-conferencing and other multimedia services at speeds of up to 4.8Mbps. It is backward compatible with cdmaOne and CDMA2000 1X.

ADC has launched a Long-Range Coverage Solution (LRCS) for wireless operators deploying UMTS networks. The Digivance LRCS is an all-digital RF transport system that distributes radio capacity from a base station over optical fiber to high mobile-traffic areas. Digital RF transport technology allows radio capacity to be centralised at convenient, low-cost locations and distributed to small, easy-to-locate remote units placed at the desired coverage area.

HP has created a Center for Wireless Networking as part of invent@mit, a $25million, five-year multi-faceted research alliance launched by HP and MIT in June 2000. Researchers at the center will work on diverse aspects of wireless research without the limitations of current architectures or current products. The work will focus on a radical, interdisciplinary approach to wireless system design that is intended to dramatically extend the battery life of portable appliances, significantly increase the reliability and data rates of mobile network infrastructures and provide the flexibility to support entirely new classes of applications and services.

NTT DoCoMo has begun constructing an experimental system for 4G packet wireless communications featuring transmission speeds in excess of 100Mbps downlinks and 20Mbps uplinks. The experimental system, which will incorporate base station and mobile station equipment, will demonstrate key technologies for 4G systems that DoCoMo hopes to launch commercially by 2010. Practical evaluations should start this summer. DoCoMo's experimental 4G system employs Variable Spreading Factor (VSF) and Orthogonal Frequency Code Division Multiplexing (OFCDM) technologies to mitigate the impact of severe multipath interference. Meanwhile, the Japanese operator has begun licensing patents for its proprietary WCDMA technology. The company will offer essential patents at reasonable and non-exclusive terms. The application form, WCDMA essential patent list and further licensing information are available at www.nttdocomo.com/html/wcdma.html

DoCoMo is also working on the world's first lip-reading telephone. The company has developed a prototype and hope to have a lip-reading mobile phone available in about five years. Contact sensors near the mouthpiece in the phone detect tiny electrical signals sent by muscles around the mouth. A speech synthesiser converts the signals into spoken words or text for a message or e-mail.

SiRF Technology has announced an alliance with Motorola to integrate SiRF's GPS technology into the iDEN family of wireless phones to location-enable the devices and meet the requirements for the FCC's E911 mandate. The handsets will implement SiRF's SiRFstarII architecture and SiRFLoc-based high sensitivity technology, which is optimised for location acquisition in low signal environments.

Researchers at Motorola Labs have built and deployed a world-class measurement system that supports the study of multiple antenna technologies for channel bandwidths of up to 5MHz. According to the company, multiple antennas for both cellular site and handsets have been shown to, theoretically, enable major increases in the data capacity, peak data rate and voice capacity. However, the actual achievable performance depends on the properties of the radio signal propagation environment. Accurate models that characterise the propagation environment are therefore key to predicting the true channel capacity improvements. Motorola Labs' channel measurement system enables virtually simultaneous measurement of the propagation paths between all combinations of site and user equipment antennas in both the uplink and downlink directions. The channel measurements are repeated 1600 times per second continuously along the entire drive route. This enables the development and evaluation of channel models that mathematically describe what happens between all of the transmitting and receiving antennas. The channel models can then be used in simulations that model the signal processing in the cellular handsets and base stations to predict the channel capacity, peak data rate and voice capacity. Motorola Labs' channel measurement system was installed at two sites in an urban area, and a PDA and laptop were each fitted with four antennas to create a real world user test. Trials have also been conducted using cellular handset prototypes that have multiple antennas. More than 2,000 gigabytes of channel data have been collected so far, enabling evaluation of various multiple antenna technologies such as transmit and receive diversity, beamforming and MIMO (Multiple Input, Multiple Output). The performance evaluation confirmed that significant improvements in both data and voice capacity are achievable in the mobile environment.

According to researchers at Bell Labs, bursts of microwave energy from the sun can disrupt wireless cell communications several times a year. The researchers say they are worst at so-called solar maximums, which are marked by sunspot and other activity and which cycle every 11 years but the bursts can come at any time. According to the researchers, solar radio bursts strong enough to disrupt a cellular telephone call occur between 10 and 20 days a year.

Lucent Technologies has announced a breakthrough from Bell Labs that dramatically increases the efficiency of a critical chip used in the company's UMTS network equipment. According to the company, the new chip design will substantially increase wireless network capacity, consequently reducing costs for mobile operators. The innovative new baseband processor offers substantial performance improvements for Lucent's base station equipment, allowing these systems to serve up to 10 percent more customers. It also makes possible less power-hungry mobile devices able

to accommodate multimedia communications. The company claims to be the first in the industry to combine the digital encoding of voice and data signals in a single channel while complying with the latest UMTS specification established by 3GPP. The Bell Labs innovation, technically described as a "Unified Turbo/Viterbi Channel Decoder," is the only available silicon codec implementation with built-in support for the 3GPP turbo interleaving algorithms, bit-error-estimation for accurate power control and first level 3GPP channel de-interleaving.

Wireless Industry Forecasts and Surveys

A report from Gartner Consulting reveals that wireless e-business revenue grew by nearly 50% last year over 2000. In 2001, wireless e-business brought in $110bn compared to $75bn in 2000. Most of the revenue came from business-to-employee application development, with middleware proving to be an important component of the growth.

Gartner Dataquest has said that global mobile phone sales in 2001 were below 2000, which represents the first decline in the history of the industry. The sales declined by 3.2% where as the market experienced an average 60% growth rate between 1996 and 2000. According to a study of the Shosteck Group, the future success of mobile phone makers will depend on their ability to sell "replacement phones" because 77% of total global unit sales by 2005 will come from consumers intent on replacing older phones. The company expects the total handset sales to grow to 455million in 2005 from an estimated 427million in 2002. In 2001, only 20% of the 390million handsets sold in the world were replacement phones, down from the 36% replacement rate in 1999 and 2000.

The consulting firm Ovum predicts, in its study "MMS and SMS: Multimedia Strategies for Mobile Messaging", that annual consumer revenues from multimedia messaging services will reach around $70billion worldwide in 2007 with some $29billion coming from Western Europe. Around $31billion will come from person-to-person messaging while $39billion will come from machine-to-person messaging. Moreover, Ericsson expects that MMS will overtake the SMS service within the next years. Last year an estimated 102.9billion SMS messages were sent worldwide.

A new survey of 2,000 wireless phone users conducted by the Yankee Group reveals that one quarter of the respondents would switch to another carrier for lower prices and 20% will switch for improved coverage. Only 6% said that Wireless Internet and text messaging options would convince them to stick with their current operator.

A survey of 700 US households conducted by IDC, reveals that the top three applications used by mobile phone users are all location-based services. The applications are emergency assistance, navigation services and concierge services. Previous top uses including e-mail and stock quotes were behind the location services.

Spectrum Licenses

France's ART telecoms regulator has said that only Bouygues Telecom has applied for one of the two outstanding UMTS license. The GSM incumbent operator applied for the license after the regulator lowered the initial costs and extended the license term. The decision concerning Bouygues's application will be announced in September and it is still unclear what would happen to the fourth remaining license. In Ireland, only three companies, Vodafone, mmO2 and Hutchison Whampoa, have submitted bids for the four available UMTS licenses. The incumbent operator, Meteor, did not submit a bid. The 20-year licenses are offered via a "beauty contest". The regulator is also planning to give extra spectrum to new entrants and will force incumbent operators to allow roaming on their GSM networks. These measures will benefit Hutchison who is the only company not present already in Ireland. In Slovakia, only one company, Profinet.sk, bid in the tender for a combined GSM and UMTS license. The two Slovakian incumbent operators have applied for the two available individual UMTS licenses. The individual UMTS licenses will be sold for $33.86million each where as the combined GSM/UMTS license will be sold for $34.3million. Tele2, Orange and EPT have been awarded UMTS licenses in Luxembourg. However, the country did not receive any bid for a GSM1800 license on offer. Pan-European operator Tele2 has also been awarded two 10-year GSM1800 licenses in Russia to provide service for the city of St. Petersburg and the surrounding area. The Russian Telecommunications Ministry also awarded GSM1800 licenses to the AMPS operators TumenRusKom and BeeLine Samara. Sweden has awarded its fourth GSM license to the sole bidder, SweFour. The company will not become a mobile operator but will instead focus on building and operating the GSM network. Other companies will be invited to use the network.

New Zealand's TelstraClear has sold the management rights for 5MHz of 3G mobile spectrum to Vodafone. This deal was required due to the previous merger between TelstraSaturn-Clear Communications and the government regulations which do not allow a 3G license holder to own more than 15MHz of spectrum. New Zealand has also announced that it is going to auction 16 lots of radio spectrum in late July. The blocks of spectrum to be auctioned are: nine blocks of 3.4-3.6GHz; five blocks of 24.5-26.4GHz; spectrum around 900MHz and a block of 2GHz spectrum. The Malaysian government has received five bids for the three 3G mobile phone licenses available. The bidders included three of Malaysia's current five mobile operators. The decision is expected to be announced at the end of July. The 15-year licenses are being awarded through a "beauty contest" for a fixed fee of $13.2million. The Afghan Wireless Communications Company (AWCC), joint venture between the Ministry of Communications and US-based TSI, has launched a GSM network in the Afghan capital of Kabul. Under the first phase the network will be extended to Herat, Mazar-i-Sherif, Jalalabad and Kandahar. The network has an initial capacity of 20,000 lines. The Afghan government has also invited international firms to apply for a Mobile Wireless License.

Zambia has awarded its 4th National Mobile Cellular Service license to the Vodacom Zambia Consortium. The company has a target of 600,000 subscribers within 5 years. Egypt's Orascom Telecom has won the second GSM license in Tunisia after offering $454million for the license. Nigeria has approved a total of 30 licenses to operate fixed wireless phone services in an attempt to break the monopoly of state-run Nitel. The government had received 186 requests from 50 bidders. Nigeria is also planning to issue new licenses to around 80 operators. Malawi's telecoms regulator has announced it is planning to license its third mobile phone license. The two current operators have only about 60,000 subscribers in a country of around 11million people.

Bids have been invited for a fourth mobile phone license in Jamaica. The license will be offered via a "beauty contest" and the winner will not be able to start commercial operations before full market liberalisation on 1st March 2003. In Brazil, no bids were received for the latest auction of band-D and band-E PCS mobile licenses, even if Anatel, Brazil's telecoms regulator, eased the bidding rules. Colombia is

planning to hold a public auction for licenses of PCS C-band after August.

Wireless LAN and Bluetooth

Red-M has announced version 2.1 of its Genos core software which enables the full integration of 802.11 wireless LAN and Bluetooth into one unified wireless network supporting the vast range of multi-vendor wirelessly-enabled devices and applications. The software implements a unique 5-layer wireless security model that provides unparalleled control and security over an entire wireless network.

BT has announced plans for a nationwide WLAN network in the UK, offering 3G comparable data speeds in up to 4,000 hot spots by June 2005. The company has signed up Cisco and Motorola to provide the equipment for the WLAN network buildout. Red-M will provide Bluetooth equipment to be used in conjunction with the 802.11b WLAN kit.

Redknee has announced the availability of their Wireless LAN Gateway which will enable WLAN networks, operating on either 802.11 or a HIPERLAN framework to be integrated with GPRS and UMTS networks. With the gateway, subscribers will receive a single bill for voice and data even while roaming. Air Media Now! And Calypso Wireless have successfully conducted their ASNAP wireless LAN to GSM/GPRS handoff trials. Green Packet and WiFi Metro are conducting field trials marrying cellular and WiFi Metro's 802.11b networks.

US Robotics said it has introduced a new WLAN standard, called PBCC022, that offers data speeds up to 22Mbps while offering full compatibility with the existing 802.11b standard.

According to a study by In-Stat/MDR, handsets equipped to handle calls using 802.11 mobile networks are expected to surpass 500,000 units by 2006. According to the study, "additional demand from verticals such as healthcare, education, retail and logistics will help the overall Voice over WLAN market to expand to over 80,000 handset shipments in 2002".

Wireless and Public Safety

The Cellular Telecommunications & Internet Association (CTIA) organised the Wireless Safety Week with the main theme being "Wireless Serves Safety". This year's Wireless Safety Week highlighted the important role wireless plays in both personal/public safety and homeland security, and encouraged the responsible use of wireless technology while driving. An example of the initiatives promoted to provide personal safety by means of wireless technology is the Wireless Foundation's CALL to PROTECT program sponsored by Motorola. The program provides mobile phones to victims of domestic violence and to domestic violence professionals. The phones are pre-programmed to dial 911 so that the persons can ask for help with the push of a button. During the Wireless Safety Week, the CTIA released the average daily wireless emergency service calls for 2001, nearly 156,000 every day or about 108 calls per minute.

At its fourth meeting, held April 10-12th, Project MESA, the public safety mobile broadband standardisation group, outlined the future for telecommunications services in support of public safety and disaster relief workers. During the meeting, the Project experts from 11 countries in North America and Europe, representing both industry and government agencies, together with ETSI and TIA approved the first service specification document, known as a statement of requirements (SoR). The SoR, defined by Public Safety users, outlines advanced mobile broadband scenarios and definitions of the services to be supported by broadband public safety mobile telecommunications networks. The SoR is based on scenarios and analyses of real-life events, such as the September 11th World Trade Center and the Pentagon attacks. The analyses will be attached to the SoR, which, after editing, will be available on the Project MESA web site (www.projectmesa.org).

Lake County, Ohio has accepted a new Motorola communications system that provides interoperability among the county's public safety and public service agencies. The shared Motorola ASTRO SmartZone mixed mode system (digital and analogue) will be used by 40 public safety agencies. The system includes four sites and 13 channels for voice communication. Fauquier County, Va., also announced it will be purchasing a Motorola 800MHz ASTRO digital trunked wireless communications system, including six channels and five sites. Summit County, Ohio, and the City of Akron, Ohio, also joined forces to purchase a 800MHz ASTRO SmartZone mixed mode communications system. Motorola and the City of Houston announced a contract that will make the city the first to use Motorola's Premier Handheld citation application that will enable Houston's police officers to wirelessly retrieve and relay data, and prepare traffic citations on the spot from a single handheld device.

The FCC has adopted a Report and Order that takes further steps to improve the ability of public safety answering points to respond quickly and efficiently to calls for emergency assistance made from a wireless mobile telephone. Specifically, the Commission addressed issues associated with the inability of a PSAP to call back a 911 caller who is disconnected when that caller is using a non-initialised wireless telephone. Non-initialised wireless telephones are phones that are not registered for service with any Commercial Mobile Radio Service (CMRS) carrier. The FCC has also adopted a Notice of Proposed Rulemaking to explore ways to improve the spectrum environment for public safety operations in the 800MHz. The Commission stated that increasing levels of harmful interference to public safety communications in the 800MHz band must be remedied. It seeks comments on all available options and alternatives.

Initiatives and Forums

3G Americas, the new wireless trade Organization for the Americas launched last March (www.3gamericas.org), and the UMTS Forum have signed a Letter of Understanding to promote the path for successful evolution to 3G for mobile operators. The two bodies will appropriately support each other globally through educational and promotional activities to increase the visibility of the 3G market and services, strengthen the estimated 3G market opportunity and improve industry confidence in the next generation of mobile services. 3G Americas has also been accepted as a new Market Representation Partner of the 3GPP project.

Various paging and messaging industry associations from the US, including the American Association of Paging Carriers, Allied and the Southeastern Communications Association, have announced their intent to form a unified Organization to deal with legislative and regulatory industry issues on a national level.

The International Softswitch Consortium (ISC) has set up a new division, the Wireless Working Group, to promote the softswitch model for use in 2G and 3G wireless core networks where softswitches (Mobile Switching Center servers), signalling gateways and media gateways will eventually replace legacy MSCs in cellular core networks.

Wireless Data

Qualcomm has announced the second major release of its Binary Runtime Environment for Wireless (BREW) client software and BREW SDK (Software Development Kit). Dubbed BREW 2.0, the new client software and accompanying BREW SDK add increased security features to enable more robust m-commerce activities, expanded functionality for Wireless Internet activities, and richer multimedia and graphics capabilities. Handsets incorporating the BREW 2.0 client software are expected to hit the market by early next year.

AT&T Wireless has launched its new mMode data service, which gives people easy, fast access to a variety of communication, information, and entertainment services from the keypad of their wireless phone. The new service was developed in partnership with NTT DoCoMo. AT&T Wireless has said its service is available in more than a dozen markets including Chicago, Seattle and Las Vegas. The service packages costs range from $2.99 plus 2 cents for every kilobyte of data in a home coverage area to $12.49 plus a cent for every kilobyte of data over 2 megabytes.

KPN Mobile has started, from April, offering mobile data services in the Netherlands through the i-mode system. The i-mode subscription includes access to i-mode (EUR 3 per month) plus a GPRS data bundle, with the 200kB basic data bundle costing EUR 2. Content partner services range in price from EUR 0- EUR 2 per month with, at launch, approximately 50% of services being free. KPN Mobile has reached an agreement with more than 50 national and international content partners. Detailed information on the available services and pricing schemes can be found at http://www.kpnmobile.com/ KG Telecommunications, the Taiwanese partner of NTT DoCoMo, will also launch soon its i-mode service. The service will be delivered over the operator's GPRS network and will offer about 80 websites, provided by approximately 70 national and international content providers. The basic monthly fee will be $4.92 per month, including bundled free data transmission equivalent of 840Kbytes.

NTT DoCoMo has also announced that it will develop new 3G FOMA handsets equipped with a dual browser capable of handling both -compatible HTML and XHTML Mobile Profile + WAP CSS mark-up languages. The company plans to introduce the handsets by the end of this year. XHTML Mobile Profile + WAP CSS is the mark-up language for WAP2.0, the international standard for mobile internet services. Existing FOMA handsets are compatible with the transmission protocol of the WAP2.0, but not the language specifications. The next version of FOMA handsets will be fully compatible with all WAP2.0 specifications. DoCoMo, together with the Coca-Cola Company and Itochu Corporation, has announced the nationwide launch from April 2002 of Cmode, the new consumer service the three companies have been operating on a trial basis in Shibuya area in Tokyo since September 2001. Detailed analysis has shown Cmode to have high levels of consumer acceptance and to provide significant business opportunities. The Coca-Cola Group plans to install Cmode-compatible vending machines called "Cmo" sequentially from April, with some 2,000 units, across Japan by year-end. "Club Cmode" members will be able to buy admission tickets to amusement facilities, pay-per-download of information content and local area information such as maps starting April 15 via Cmo machines.

Other News

Siemens and Motorola have announced a collaboration on the development of Siemens mainstream UMTS terminals using Motorola's i.300 Innovative Convergence 3G platform, a comprehensive silicon-to-software, integrated UMTS solution. The first UMTS terminals based on the i.300 platform are expected to be available in early 2004. Siemens has also announced an agreement with Nokia on a framework of collaboration to create and drive the implementation of mobile terminal software based on open standards. The companies intend to define and promote common functionality and features for different mobile terminal platform categories throughout the industry. Nokia has also released a statement advocating an industry-wide commitment so that royalty rates for the 3G technology should not exceed 5% cumulatively. Under this proposal no manufacturer should pay more than 5% royalties covering all essential WCDMA patents from all patent holders.

Mitsubishi and Toshiba have announced that they will collaborate in the development of 3G mobile phones. The companies will jointly develop a platform for the phones. NEC, Matsushita and Huawei Technologies have also established a joint venture to further expand the 3G mobile handset business of NEC and MCI.

Convergence 2002

Transportation Electronics = Business + Technology + Process

Convergence 2002 will be held this year between October 21-23, 2002 at the Cobo Center in Detroit. Convergence 2000 drew more than 9,000 attendees and 250 media from around the world. Exhibit space for the 2002 conference has been increased by 35 percent and will feature over 180 state-of-the-art exhibits, occupying two halls at the Cobo facility.

Past Convergence conferences have focused exclusively on the technology of automotive electronics. Convergence 2002 will take an unprecedented approach to transportation electronics. This year's conference will not only focus on emerging technologies, but will add the business and processes required to complete the transportation electronics equation.

The business aspect has been left out of past conferences. Convergence 2002 recognizes that ninety percent of the automotive innovations are triggered by electronic or information technologies. But the OEM's don't develop the components. What are the challenges for the industry in this "sandwich position?" Additionally, what opportunities and risk are presented in new collaborative business models? How can companies assure profitable growth in a climate dominated by mergers and acquisitions? And finally, how can we meet the challenges when automotive electronics are "fast-followers" to the IT and PC industries.

As always, technology is the key focus of the conference. An entire day of sessions will debate safety innovations, infotronics, safety standards, comfort, convenience and functionality. What technologies are available that might challenge or force change in our business models? What are the technologies of the future? The sessions will provide a report card on current developments and offer a glimpse of plans for the future.

Technology cannot be sold without adequate processes – the final piece in the transportation equation. Collaborative product creation, collaborative manufacturing, quality management and diagnostics are important prerequisites for developing efficient processes to insure time to market with controlled costs and expected quality.

The Convergence 2002 theme of Transportation Electronics being about Business and Technology and Process conveys the importance of emerging technology yet expands to include the process and business aspects, which have an enormous effect on the total automotive equation. This expanded scope of Convergence 2002 continues the tradition of providing the world with an effective platform for technological exchange.

As noted by Bernard I. Robertson, senior vice president of DaimlerChrysler and chairman of Convergence 2002, "The goal of Convergence is to bring together key industry leaders to exchange ideas on the future of automotive electronics technologies while addressing important technological, societal and business issues affecting the application of electronics in the automobile. We are fortunate to have a top-notch lineup of speakers this year that blends the pioneering spirit with the forward-thinking vision that will lead our industries into the future."

In addition to Robertson, who will open the conference, Convergence 2002 speakers include:

- Dick Brass, vice president of Technology Development at Microsoft Corporation, the worldwide leader in software, services and Internet technologies for personal and business computing, is featured as the opening keynote speaker on Monday.
- Wolfgang Dehen, president & CEO, Siemens VDO Automotive AG, one of the world's leading suppliers of electronics, electrical products and mechatronics to the automotive industry, will immediately follow Mr. Brass on Monday.
- Dr. Wolfgang Ziebart, deputy chairman of the Executive Board Continental AG, a global company specializing in the development and production of promising systems in the areas of brake technology, vehicle dynamics control, tires and energy management, will be featured as Monday's afternoon keynote speaker.
- Chris Galvin, CEO of Motorola, a global leader in providing integrated communications and embedded electronic solutions, will give Tuesday's keynote address.
- Thierry Morin, CEO of Valeo, one of the world's top suppliers of components, integrated systems and modules, will begin Wednesday's sessions with a morning keynote address.
- Alex Lidow, CEO of International Rectifer, a world leader in power management technology that improves functionality, speed, compactness, and portability in information technology and other end products, will be featured as Wednesday's afternoon keynote speaker.
- Dr. Dieter Zetsche, president & CEO of Chrysler Group at DaimlerChrysler, will conclude Convergence 2002 by serving as the keynote speaker at the closing banquet on Wednesday.

The overall program of Convergence 2002 has been broadened to address three important aspects of automotive electronics – the product, the process and the business which together will encompass the theme: Transportation Electronics = Business + Technology + Process.

The three-day conference, hosted this year by DaimlerChrysler, will include panel discussions with participants representing the leading edge of the automotive and electronics industries and more than 75 technical papers addressing important technological, societal and business issues affecting the application of electronics in the automobile. Other automotive industry leaders scheduled to play a key role during the course of the conference include: J.T. Battenberg III, Chairman, CEO & President of Delphi; Keith Crain, Chairman of Crain Communications; Dr. C.K. Prahalad, Harvey C. Fruehauf Professor of Corporate Strategy at the University of Michigan Business School; Paul Hansen, Publisher of the Hansen Report on Automotive Electronics; and Trevor O. Jones, founder of Convergence.

To register on-line visit the Convergence 2002 website at www.convergence2002.org.

Technical sessions

Process sessions (held on Monday)

Session #P1: Collaborative Product Creation

In today's product creation process, OEM'S and their suppliers are involved simultaneously. To make this collaborative electronics development process more efficient, a closed loop value chain enables consistent and open data flow across the stakeholders. What would such a development value chain look like? What tools and processes are necessary to achieve this objective? This session explores several creative alternatives to these questions.

Session #P2: Collaborative Manufacturing

Along the added value chain from E/E specification, to E/E design, to E/E development, and then on to E/E manufacturing, a balanced work sharing between all parties involved is essential for business success. What experience is available in designing this added value chain? How do we partition this work share considering that automotive electronics needs do not really define mainstream electronics development, consumer electronics products do? How do we as manufacturers and suppliers deal with the long-term upgrade-ability needs of automotive electronics? How do we manufacture electronics that have a short innovation cycle when compared to the lifetime of a vehicle?

Session #P3: Product Integrity

Quality issues of E/E systems in a vehicle, being values by their own, determine the warranty and goodwill costs to a large extent. The increasing complexity of the E/E system is the main reason for that. Compared to the mechanical components of a vehicle, our knowledge about the reliability issues of the E/E system is poor. What are the relevant E/E failure structures? How do we do a better job of detecting E/E system failures? One key to answering these questions could be an improved field data management program in combination with an overall process dedicated to "design for E/E quality".

Session #P4 - Diagnostics

With the ever-increasing complexity of the E/E system and the application of sophisticated electronics, the implementation of a clear diagnostic strategy becomes inevitable. What diagnostic information is necessary for efficient vehicle maintenance? In what way should diagnostic information be collected, stored, distributed, or broadcast from the vehicle? How much of the collected diagnostic information does the driver need or want? In what form should this information be provided to the driver?

Presently, OEM's use traditional methods of on-board diagnostics but are also considering new concepts for

off-board diagnostics. What are the tradeoffs when considering on-board versus off-board diagnostic methods? What are the benefits or shortcomings of centralized and decentralized maintenance concepts? Future maintenance concepts may also focus on remote diagnostics. This will form a basis for a visionary remote (E-) recovery of the vehicle via a customer assist center. How will remote diagnostics capabilities change the vehicle development process?

Technology sessions (held on Tuesday)

Session #T5: Safety Innovations

Safety standards, rules, regulations, laws, and litigation all influence how we develop and introduce new automotive safety technologies. Occupant detection and tire pressure warning systems are a direct result of new standards and regulations. And there are other safety-related technologies and products available that are not used on automobiles because they are too expensive or require too many product changes. The goal for this session is to explore safety innovations that are at the core of the automotive equation. What technologies can be used to meet future safety standards? What technologies are available that might challenge or force change in our business models or product processes? And what will be the future of automotive safety systems?

Session #T6: Clean & Efficient

Strict standards for engine emissions and vehicle fuel economy will continue to challenge our product creativity. New powertrain technologies will undoubtedly be necessary to meet these challenging goals for the future. And as we develop electric, hybrid, fuel cell, and other alternative powertrain systems, the distinction between traditional mechanical and electrical systems will blur. Systems will become more "Mechatronic" in nature. How we design these future Mechatronic systems is an important topic to cover at Convergence. The shift from engine management systems to full vehicle management systems will drive new process development and more sophisticated electrical control systems. What technologies do we envision that will drive this change? How will these electrical and electronic technologies affect the automotive equation?

Session #T7: Functional & Fun to Drive

How do we satisfy the customer's emotion needs? With all the required systems on-board to meet the imposed standards and regulations, how do we make the product still fun to drive? This session should develop technology ideas to satisfy this equation. How can we link the customer closer to the vehicle, involve them deeper in the driving process, and attract more driver attention? How do we breakdown the isolation the customer has with the environment they are driving in? What technologies are available that allow us to improve the customer-to-machine interface? How can we make the vehicle simpler, yet more enjoyable, to operate? Cars that are fun to drive sell themselves. Technology that makes a car fun to drive supports the business needs of the automotive equation.

Session #T8: Infotronics

What are the informational and communication needs of the driver and passengers? Although Telematics technology itself has been the central focus of previous Convergence programs, new technology and developments continue to emerge in the area. Telematics and Satellite Radio service products must be built on a business strategy to be successful. How does the equation make money and provide value to the customer? What technologies and strategies will be used to satisfy the automotive equation in the future? What is the impact of infrastructure related technologies (i.e. 3G cellular) and business decisions on automotive products? How do consumer electronics prices and available technology impact automotive offerings? This session should provide a report card on current developments and offer a glimpse of plans for the future. Infotronics provide a clear example of how the technology is available, but must be supported by the business and process portions of the equation to become a viable product.

Session #T9: Comfort/Convenience

Technologies must also be used to maintain and improve an acceptable level of comfort and convenience. How do we fulfill the customer's expectations for comfort? Exceed their expectations? Convenience innovations usually come at a cost to the customer. Comfortable seats with more adjustments cost more. What technologies make sense from a business perspective? And what comfort innovations challenge the process we use to create the automobile? Are there new chassis or suspension innovations that improve road feel yet require changes in the manufacturing or other processes? The automotive equation requires us to consider all three to make a successful product. The goal for this session is to include new and innovative technology that considers the entire equation. What future technology is out there that challenges our current business and process models?

Session #T10: Enabling Technologies

Besides safety, and emissions, other new standards and regulations continue to emerge that will reformulate our processes and business plans. Emerging electrical component technologies will also drive change in business and process decisions. Standards, such as those proposed for common vehicle bus architectures and/or open platform computing, will force us to adopt new product processes. Future semi-conductor fabrication technology and component availability will drive new business models. How do we keep pace with technology and adapt to consumer electronics trends? And emerging "Mechatronic" system standards, such as those for 42V architectures, will require us to invent new system and component technologies. This session should explore component technologies and system standards that generate the need to evaluate business plans and process changes. The technology should be discussed, but not necessarily the business models. What are the enabling technologies of the future? And how will future component technologies and standards be used to solve business or process related problems?

Business Sessions (held on Wednesday)

Session #B11: Content and Mobility Providers

The convergence of I&C, content providers, mobility providers, and OEM's can create a wide spectrum of new business opportunities. New services built on mobility and infotronics can also provide the chance for the OEM and content providers together to share customer data, services, and information technology hardware (including vehicles). But the risks are the limited profit potential in the downstreaming business as well as the diluting of vehicle brands by mobility brands. Based on intelligent IT-networks, is there a chance for creating a range of end-to-end services of entirely new quality supplied by new collaborations between I&C, mobility and vehicle OEMs? What are the chances and risks associated with these new services in

terms of brand integrity, access to direct customer requirements and feedback, and vehicle distribution networks? What are the business decisions and partnerships necessary when providing information content to the customer?

Session #B12: Alternative Fuels & Power Drives

Can we meet the standards & regulations with profitable growth by creating Hybrid and Fuel Cell Vehicles? What is more profitable: to meet the fuel economy targets or to pay tax? How can we influence the regulations & standards by new technologies? How do we create a win-win-win-situation between government, customer demand, and shareholders? Is the automobile industry a promoter or a fast-follower of alternative fuels? How can we penetrate the market with alternative drives very fast to achieve scaling effects? How can we manage the investment - risk- challenge of alternative fuels and drives? Should the automotive industry go into deeper collaboration with the fuel industry? What role will electrical and electronics play in the alternative fueled vehicle business decisions?

Super Session #B13 - Convergence and Its Business Implications

Three business sessions will be combined into one super session and the audience will participate through ARS – "Audience Response System." With the help of audience responses on hand-held computers, allowing participants to respond to panelist's questions in "real-time", panelists from around the world, lead by Dr. C. K. Prahalad, Harvey C. Fruehauf Professor of Corporate Strategy, U of M Business School, will dissect the following:

Is the car a computer on wheels? Will the car become a node in a large global network? And if the car is a node, what will be the process to make money on it? Are the automotive OEM's becoming just another Boeing? Assembling an array of components from a variety of worldwide suppliers in just in-time fashion? Systems integrators not metal benders? Who is the automotive industry competing with? - Is it Microsoft? Onstar? AOL? Yahoo? What is global/What is Local? How do we personalize/customize the product? How do we differentiate ourselves? How do we go to Market? There are over 15 million cars produced annually in the USA, with an average electronics content of $3000 each, which makes the automobile industry a 45 billion dollar electronics industry! Why are the automotive companies NOT involved in setting global standards for consumer electronics instead of being at their mercy? How does consumercentricity (i.e. internet) change the playing field? What are the new challenges inside the automotive company? Should cycle timing be based on software availability and consumer electronics? Six months instead of 36 months? How do we create mechanisms internally for innovation? What is the relationship between OEM's and suppliers? How are they re-partitioning?

Panelists include Keith Crain, Chairman, Crain Communications Inc; Dr. Curtis R. Carlson,President & CEO, SRI International; Dave Wohleen, President, Electronics Sector, Delphi Corporation; and Richard Schaum, Executive Vice President, DaimlerChrysler.

A further panel will be held on the Tuesday, moderated by Paul Hansen, Publisher and Editor of The Hansen Report on Automotive Electronics. The objective for this Panel is to gather the number one electrical engineers from carmakers in the United States, Europe and Japan to learn directly from them about the trends and demands for auto electronics technology, parts and tools. Confirmed panelists include Heinz-Georg Burghoff, Director, Electrical/Electronics, DaimlerChrysler AG; Hans-Georg Frischkorn, Vice President, Electrical/Electronics, BMW AG; Toyohei Nakajima, Division Director, Honda R&D Americas, Inc.; Karl Thomas Neumann, Director Electronics Research VW AG; Cary Wilson, Director, Electrical/Electronic Systems Engrg., Ford Motor Co. and Matt Tsien, Exec. Director Electrical, General Motors.

Report on VTC2002-Spring in Birmingham, AL

The Spring VTC was held this year in Birmingham, Alabama from 5-9 May 2002, attracting an interesting and wide-ranging selection of papers. As expected, the US contributed most papers (116). South Korea had 45 and Japan 38, but second place was held by China at 50 papers. The UK was 5th with 32.

Southern hospitality was evident throughout. The Conference Chair, Preston Jackson, and the Technical Chair, Dr. Charles Hickman, could be seen working hard throughout not only ensuring that the conference ran smoothly, but that attendees sampled Southern culture during their stay (especially with regard to cuisine!). However, the warm reception did not stop there. One delegate, when asking a policeman for some directions, was given a lift part of the way in the (presumably unlocked) back of the patrol car.

The keynote speaker at the opening plenary was Ed Salley, who is head of the Wireless Service Division of NorthStar. Prior to joining NorthStar, he served as a Senior Vice President at AT&T Wireless. Ed Salley gave what he described as a view from 30,000 feet, talking about the technology, regulatory position, and so on, concluding with his personal views on where the industry was going.

He has seen a lot of peaks and troughs in his time in the industry. There was considerable turbulence at the moment. These turbulent factors included declining average revenue per user (ARPU), slowing subscriber growth, and cut-throat pricing. Will customers be prepared to pay for 2.5G or 3G services? This is something worrying Wall Street. Large network upgrades will be required – costly in tight capital markets – and if they do, will there be enough spectrum for the new services? All this is taking place in the context of a depressed stock market. The result was a customer's dream but an operator's nightmare.

However, it has been quite a ride until now. It took 21 years to get the first 500 million wireless customers, but only 25 months to get the next 500 million. Wireless is pervading everything, everywhere. The mobile US workforce is expected to grow to 47 million by 2003, while wireless data users will grow from 6.6 million in 2001 to 160 million in 2008.

Business customers want a lot. They want quick retrieval of relevant information, including corporate data, everywhere. They want the wireless Internet, no intrusive adverts, an always-on connection, digital music and games, and of course telephony, but will they pay for it? A number of new services had grown in different areas, but there was a lack of uniformity. Short message service (SMS) is hot in Europe. It is expected to grow from 186 billion short messages in 2001 to 365 billion in 2003, although growth will slow after that. This

has helped operators slow decline in ARPU, with short messages now contributing 10% of total revenue.

High-speed data is a hot in the Asia-Pacific region. In Japan, about 40% of subscribers of access i-mode, and South Korea was the first 3G operator with a cdma2000 1xEV-DO system. However, will these behaviours translate to the US?

Wireless LANs are hot in the US. Wi-Fi (802.11b), is fast (up to 11 Mbps), cheap, easy, and uses unlicensed bands. It is popping up everywhere, in airports, 530 Starbucks (coffee shops), and hotels. Sales of wireless cards are expected to grow from $1.9 billion in 2001 to $5.2 billion in 2005. Will this help or hinder 3G initiatives? There are also issues with security and privacy and the capability of the networks these WLAN access ports and connected to in terms of their broadband capabilities. Some users only want wireless connectivity when travelling, not in a normal office environment, as DSL and similar technologies provide all they require. Mobility in an office is useful for voice, but is not really needed for data, which people require only at their desks.

Globally, the industry is betting on data as the growth engine. Voice service revenues will flatten globally, with ARPU continuing to decline. Commentators predict that growth in high-speed data services will account for nearly 40% of revenues of wireless carriers by 2010, although this will not occur in the same way in each country.

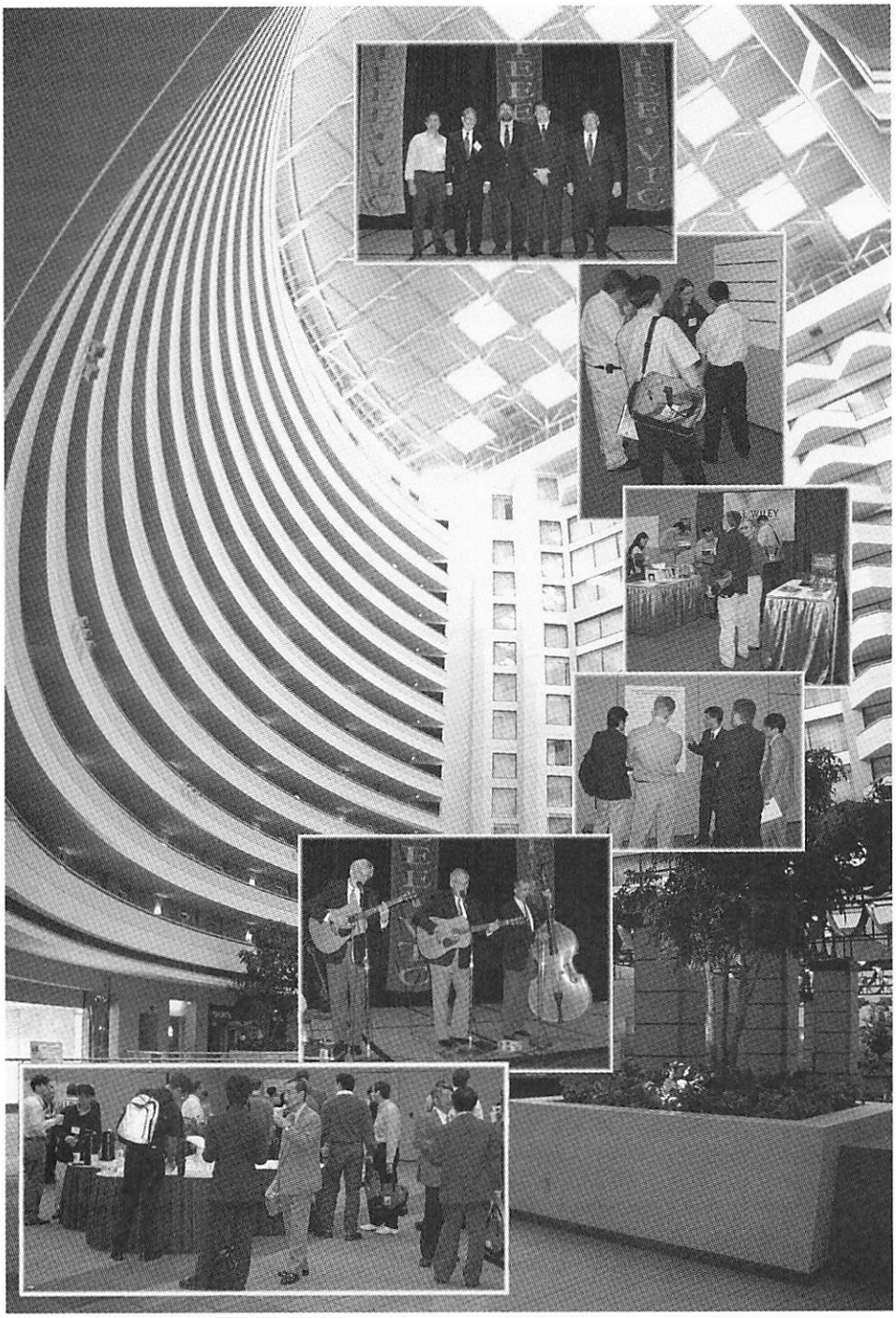


Figure Scenes from VTC2002-Spring, including members of the conference committee (left to right: Joe Long, Dr. Charles Hickman, David Green, David V. Connor, Preston L. Jackson),and 'Three on a String', who provided Southern entertainment for the banquet. The background is the Sheraton Hotel, where the conference was held.

An interesting question is what customers want. A survey of IT professionals gave email as the most important application required (at 43%), with web browsing trailing at 4%. Since calendar and phone book applications had 12% support, the most important data application is likely to be an integration of email and calendar functions, rather than any new innovative service. Simple applications will drive demand.

Early signs suggest that the 2001 storm may soon be over for wireless companies in the US, but churn is a killer for carriers. This varies between networks, but in the US is between 26.4% and 33.6% annually. Between 28 and 37 million US customers switched networks last year, and since it costs an average of $320 to acquire each new customer, churn cost US operators 17% of revenues, which translates to 75% of margins. The reasons for churn are not intuitively obvious. Being lured by another operator was given as a reason for moving by only 9% of transferring subscribers. The most popular reason was a dislike of the handset (31%), while 28% of subscribers said that the low usage plan was too expensive, 17% blamed poor coverage, 7% blamed poor customer services, other reasons accounted for 8%.

The prediction is for capital spending to increase, but this increase will occur in handsets, not in the network infrastructure. Wireless equipment sales will grow from 2003 after a slight contraction in 2002, but carriers are expecting to significantly decrease core network expenditure to im-

prove cash flow, so network infrastructure expenditure is peaking now. They need to realise current investments from the system first before investing in further network infrastructure. This has important implications for 3G. Carriers, especially in the US, need more spectrum. Most US carriers have 25 to 40 MHz, which is not enough for 2.5G or 3G services. In the US, the Commerce Department has urged the FCC to develop quickly the secondary market for spectrum, but on the 17th of April this year, the Administration proposed that the 700 MHz spectrum options be postponed from 2004 to 2006. The need for more spectrum will increase the likelihood of mergers, with perhaps the six dominant US operators contracting to four, but researchers need to come up with more spectrally efficient equipment.

So what happens after the storm? Ed predicted a bright future, but with significant changes for carriers. He had already mentioned he expected a contraction in the number of operators in the US to four. He also predicted one or more global carriers by 2005 - three of the six carriers in the US have significant foreign ownership. Features and pricing strategy will shift towards meeting needs of those who can pay for it, ending, or release curtailing, the customer's dream. Teenagers tomorrow will probably never have a wire-line phone, which raises a question of what happens to wire-line operators in the future. He also predicted a slow growth in demand for wireless multimedia services, with 2.5G having to last three years or more before 3G services will arrive. Operators really can't afford these sooner. Wi-Fi networks will provide most of the high-speed wireless multimedia services in the US for the next three years. Ed disagreed with predictions for an explosion in wireless gaming; he felt that this would rather be niche market at premium prices. So the future is bright, for those who can weather the storm.

Surprise entertainment for the banquet was organised in the shape of "Three on a string", who provided musical entertainment throughout the evening. The banquet speaker was Dr Keith Conner, who gave the talk entitled "From research to reality", discussing how best researchers might influence commercial and standardisation processes to ensure their results found application. He noted that the traditional engineering process was very sequential, with a trickle down in approach to results, and systems being passed from group to group – over-the-wall engineering.The increasing speed with which products are developed required simultaneous engineering, with concurrent design where researchers need to have more of an interest in how their ideas are being used in the design. Researchers must know the design process to cut down the requirement for design changes later. Dr Conner urged his audience to understand the standardisation process, and the standards that they were designing towards: learn about the product, follow the business, and since so much of research nowadays involved simulation, learn some software engineering and the principles of modelling systems.

The lunch on the final day was addressed by Bob Hawkins from Alabama Power who stood in at short notice due to a family emergency for the planned speaker. Bob Hawkins noted that the Energy Policy Act in the early 1990s had been a catalyst for electric transport in the US. The aim of this Act was to decrease the dependency of the US on imported oil. Another factor had been Clean Air Act, which addressed the issue from an environmental perspective. Alabama itself had lost some industrial growth recently as new industry could not be set up until the air quality in industrial areas had been improved. Economics are on the side of electrical vehicles, costing 1½ cents per mile compares to 6½ cents per mile for gasoline driven vehicles. The sweet spot for electric vehicles are short mileage, frequent stop, flat terrain transportation. However, it must be recognised that electric vehicles are a niche market, and they have to be targeted towards this. There are a number of issues which have to be addressed, such as the initial cost, range, product availability, and infrastructure. A number of current efforts are in process, for example company fleets, transit buses, and non-road applications. A good example of the latter are airport service vehicles. If a new airport wishes to build a new runway, environmental regulations require it to reduce emissions from its existing operations by at least as much has the increased emissions caused by the new runway, and electric vehicles were an ideal way of doing this.

The future for electric vehicles lay in fast charging (currently an 80% charge takes about 2 hours, with the 100% charge taking 4 hours, but it was hoped to reduce the 80% charge time to 30 min), hybrid vehicles, neighbourhood electric vehicles (NEV) and robotic material handling vehicles. Bob Hawkins went through a list of the various electric vehicles which are currently available, noting that military had recently ordered a hundred thousand electric Humvees, with an 8 hour stand-alone capability. The low heat signature of electric vehicles in a battlefield gives them a significant advantage.

A series of ten well-attended tutorials were preceded the conference. Some of these tutorials were recorded by the IEEE Educational Activities Board, as part of a series of trials as to how best to capture the technical information presented at conferences and make it available to members more generally.

Preston Jackson closed the conference with thanks to the organising committee, including in two people who had had to sacrifice much but whom are usually forgotten that such events, the spouses of the General and Technical Chairs – Ann Jackson and Joyce Hickman.

Overall the conference was a more subdued affair than usual for VTC, with attendance at just under 500. This can't really be ascribed to the location – when VTC was held just down the road in Atlanta in 1996 attendance was 850 – so it likely a comment on the state of the industry. In addition, the call for papers closed in the wake of September 11, and this may have affected attendance. Industry did attend, but in smaller numbers, and roughly half of the attendees were students. Only ¼ (122 from 449) of the papers were from industry, the big players being Nokia, Motorola, NTT/NTTDoCoMo and Ericsson. Those who had come to VTC from ICC in New York the pervious week said that there was a similar quietness as far as the mobile participation there. The talk, even before the recent revelations, was of WorldCom and gloom...

A very large number of abstracts in VTC terms (just over 1150) were submitted to VTC2002-Fall in Vancouver, so it is likely that towards the end of last year a number of authors felt that they would wait and see how the world situation developed before committing to the conference round again. It may well turn out that Birmingham's loss will be Vancouver's gain. Details of VTC2002-Fall can be found on page 24.

IEEE VTS NEWS

NY Chapter wins Chapter of the Year

The 2001 winner of the VTS Chapter of the Year award was the New York chapter. As reported in previous issues, the chapter has held a number of successful technology sharing forums over the past few years, conducted at Nortel Networks. Left to Right in the photo, NY Section Chairman Ralph Tapino congratulates Ken Vought, NY Section Vice Chairman Chapter Activities, David M. Weiss, VTS NY Chapter Chairman, and Dr. Ramdane Benferhat, VTS NY Chapter Secretary on the award.

New IRSE North American Section

The North American Section of the Institution of Railway Signal Engineers is now seeking members in the C&S engineering fields who are involved in the railroad and transit industries.

Major goals of the new North American Section of the IRSE are the networking of C&S engineers and the exchange of information (both local and global) among members working in the field of communications and signaling for railroads, light and heavy rail transit agencies, consultants and suppliers to these industries. The IRSE is an international, professional organization representing individual Communications and Signaling Professionals across a wide range of industries. Information on joining the IRSE can be obtained from http://www.irse.org

The new North American Section was organized at its initial meeting in Louisville, KY on May 24, 2002, immediately following the Railway System Suppliers exhibition.

Chairman of the Section is William J. Scheerer (William.Scheerer@trans.ge.com), Chief Engineer, General Electric Transportation Systems-Global Signaling, and Secretary-Treasurer is Clayton C. Tinkham (CCTinkham@aol.com), retired Signal Engineer for Santa Fe Railway, Safetran Systems Corporation, and Southern California Regional Rail Authority.

VTS President runs for Division Director

VTS President Professor J. R. Cruz, shown opening the awards luncheon at VTC in Birmingham, is one of three candidates for the Division IX Director. The other candidates are Professor T. Durrani from the University of Strathclyde in Scotland, and Professor J Reagan from the University of Arizona.

The IEEE Societies are clustered within 10 Technical Divisions, each represented on the IEEE Board of Directors by a Division Director who serves a two-year term. VTS is in Division IX, Signals and Applications

IEEE corporate governance has a significant impact on societies, especially in the current fiscal climate, so it important to use your vote. Ballot forms will be dispatched at the end of August with candidate statements, which can also be found at http://www.ieee.org/organizations/corporate/divix.html

Letters

Dear Sir,

I greatly appreciate "A Brief History of Mobile Communications" in the May 2002 issue of VTS News.

Ever since I represented DOD at the Interim Meeting of Study Group IV (Monte Carlo, 10 February to 2 March 1965) I have been interested in the CCIR work on Modulation and Multiple Access.

I have been going through my limited Institute of Radio Engineers (IRE) periodicals without success.

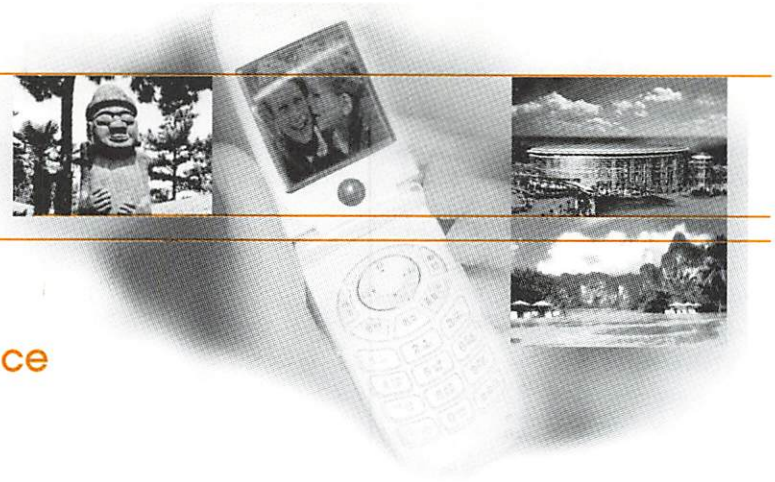
I am looking for a definitive analysis of why wideband (30 kHz) FM was selected for the original cellular system instead of 3kHz SSB.

I now suspect, based on this article, the modulation decision was made in the 1940's. Is there anyone on the staff of VTS News who can provide a reference?

Samuel Segner
West Long Beach, NJ

If any reader can shed some light on this matter, they can contact Mr Segner via the VTS News address on Page 2.

VTC 2003-Spring
JEJU, KOREA
Technology Innovations for a Tetherless Planet
IEEE



The 57th IEEE Semiannual Vehicular Technology Conference

APRIL 21-24, 2003
International Convention Center, Jeju, Korea
http://www.vtc2003spring.org

The 57th IEEE VTC 2003-Spring Conference, to be held in Jeju Island, Korea, aims to capture and present the current and innovative ideas to highly active mobile wireless society. Our objective is to provide the state-of-the-art wireless technology and a glimpse for the future of this exciting field both in academia and industries. Over 500 full technical papers and posters are expected to be presented, along with tutorials, business application/panel sessions and exhibits. Authors are invited to submit extended abstracts describing original research results, innovative applications and developments, as well as experimental or field trial/test results in the following mentioned, but are not limited to, fields of wireless communication.

Antennas and Propagation (01)
Space-time processing, Smart antennas, Channel modeling, Prediction tools, Indoor propagation

Wireless Access (02)
Spread-spectrum technology, OFDM, Multi-carrier modulation, Medium access control protocols, Channel assignment/reservation schemes

Transmission Technology (03)
Modulation, Source/channel coding, Interference rejection techniques, Equalization, Synchronization, Multi-user detection, Software radio, Transceiver design, Turbo coding, Transmit diversity, MIMO systems

Multimedia, Networks and Systems (04)
Mobile multimedia technology, Quality of service assurance, Ad-hoc networks, Mobile data/computing/navigation networks, Wireless ATM, Enhanced mobility IP, Bluetooth, IEEE 802.11, Wireless e-commerce

Wireless Personal Communication Systems (05)
3.5G and 4G Technologies, Broadband mobile communication systems, LMDS, Cellular technology, Bluetooth technology, Location techniques, Systems integration issues

Mobile Satellite (06)
Mobile satellite communications, GPS, LEO/MEO/GEO systems, Navigation

Transportation (07)
Intelligent transportation/vehicle systems, Satellite digital audio radio system, Vehicular electronics

PAPER SUBMISSION GUIDELINES

Authors must submit an extended abstract (up to 2 pages) at the same time of their short abstract submission (approx. 150 words). Forms for submission are soft copy in MS Word, PDF or PS file formats. The submission must include the name, complete mailing address, telephone and fax numbers, the designation number of the Technical Subject Area of the paper and the email address of the author(s).

PANEL SESSIONS & TUTORIALS

Proposals for Tutorials and Panel sessions are also accepted in the VTC 2003-Spring. Tutorials (Half-day or Full-day sessions) that are intended to provide in-depth learning on a specific topic of interest to the participants. Panel sessions are 90 minutes long. They present leaders in a particular area discussing a topic of interest to the attendees of VTC 2003-Spring. There is usually significant audience participation in Panel sessions. Proposals for Tutorials and Panel sessions should consist of a 250 word summary, a 100 word abstract, and a cover page listing the details of the author(s) as given above. Summaries should be submitted electronically (MS Word, PDF or PS) by September 15, 2002. Submissions should be made at the website http://www.vtc2003spring.org.

IMPORTANT DATES

July 15, 2002 First date for submission of abstracts
Sept. 15, 2002 Last date for submission of abstracts
Dec. 15, 2002 Notification of acceptance
Feb. 15, 2003 Last date for submission of camera-ready version of accepted papers

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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	
2-5 September 2002	ISSSTA 2002	Prague, Czech Republic	http://www.ure.cas.cz/isssta2002	
3-6 September 2002	ITSC '02	Singapore	http://www.ewh.ieee.org/tc/its/conf.html	
15-18 September 2002	PIMRC 2002	Lisbon, Portugal	http://www.pimrc2002.org	
23-27 September 2002	European Microwave Week	Milan, Italy	http://www.eumw.com/	
24-29 September 2002	VTC 2002-Fall	Vancouver, BC	http://www.fallvtc2002.org	
21-23 October 2002	Convergence 2002	Detroit, MI	http://www.convergence2002.org	
27-30 October 2002	WPMC '02	Honolulu, Hawaii	http://www.wpmc02.gatech.edu/	
29 October - 1 November 2002	CIC2002	Seoul, Korea	http://www.cic2002.com	
17-21 November 2002	Globecom 2002	Taipei, Taiwan	http://www.globecom2002.com	
16-20 March 2003	WCNC'03	New Orleans, LA	http://www.wcnc.org/2003	✓
24-26 March 2003	Int. Symp. On Wireless Systems and Networks (ISWSN'03)	Dhahran, Saudi Arabia	http://www.kfupm.edu.sa/ee/ISWNWeb/first_call.htm	✓
21-24 April 2003	VTC 2003-Spring	Jeju, Korea	http://www.vtc2003spring.org/	
23-25 April 2003	EPMCC2003	Glasgow, Scotland	http://www.epmcc.com	✓
11-15 May 2003	ICC2003	Anchorage, AK	http://www.icc2003.com	✓
15-18 June 2003	SPAWC2003	Rome, Italy	http://www.spawc2003.it	✓
15-18 June 2003	IST Mobile Summit 2003	Aveiro Portugal	http://www.mobilesummit2003.org	✓
23-27 June 2003	APS International Symposium / URSI Radio Science Meeting	Columbus, OH	http://aps2003.eng.ohio-state.edu/	
Fall 2003	VTC 2003-Fall	Lake Buena Vista, FL	mailto:mguizani@cs.uwf.edu	
1-5 December 2003	Globecom 2003	San Francisco, CA	mailto:GLO2003C@comsoc.org	
Spring 2004	VTC 2004-Spring	Genoa, Italy	mailto:vatalaro@ing.uniroma2.it	
29 May – 1 June 2005	VTC 2005-Spring	Stockholm, Sweden	mailto:Jens.Zander@radio.kth.se	

Conferences marked '✓' have open calls for papers as of 31 May 2002. 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.

Call for Papers – VTC2003-Fall in Orlando, Florida

The VTC-2003 Fall Conference, to be held in Orlando, Florida from 4-9 October 2003, aims to capture and present the current state of the innovative and highly active mobile/wireless industry. We seek to present the changing face of wireless technology and a glimpse in the future of this exciting field, and expect a large number of highly qualified technical papers and posters to be presented, along with tutorials, business application/panel sessions and exhibits.

Authors are invited to submit extended abstracts (up to 2 pages) describing original research results, innovative applications, and experimental or field trial/test results in Antennas and Propagation; Wireless Access; Transmission Technology; Multimedia, Networks and Systems; Wireless PCS; Mobile/Satellite Communications; and Rail and Automotive Transportation. These should be sent by **15 February 2003** in MS Word or PDF formats to the Technical Committee Chair, Willie Lu, Siemens-Infineon; wwlu@ieee.org.

Proposals for Tutorials, Symposia, and Panel sessions are also invited. Tutorials (half-day or full-day sessions) that are intended to provide in-depth learning on a specific topic of interest to the participants. Panel sessions are 90 minutes long presenting leaders in a particular area discussing relevant topics. Proposals for Tutorials and Panel sessions should consist of a 250 word summary, a 100 word abstract, and a cover page listing the details of the author(s) and sent by **January 31, 2003** to the Tutorials/Symposia/Panels Chairs, Mohamed Slim Alouini, University of Minnesota; alouini@ece.umn.edu and Markos G. Troulis, Texas Instruments-San Diego, CA; mtroulis@ti.com

The venue, Hyatt Orlando, is just 2 miles from Disney with incredible negotiated low room prices; other attractions are available just across the street, so bring the whole family for lots and lots of fun!!!

Mohsen Guizani, General Chair, mguizani@cs.uwf.edu