|  |  |  |  |
| --- | --- | --- | --- |
|  | http://pcquest.ciol.com/images04/ciolnetwork_top.gif | Wednesday, July 18, 2012 |  |
| http://pcquest.ciol.com/images04/redcorner1.gif | http://pcquest.ciol.com/images04/pcqlogo1.gif | http://pcquest.ciol.com/images04/toplinks.gif | http://pcquest.ciol.com/images04/redcorner2.gif |
| http://pcquest.ciol.com/images04/redcorner4.gif | http://pcquest.ciol.com/images04/pcqlogo2.gif | |  |  |  |  | | --- | --- | --- | --- | | |  |  | | --- | --- | | Top of Form  Bottom of Form  [Google](http://www.google.com/) | Web pcquest.com |   Top of Form  Bottom of Form | **CIOL Network sites** http://pcquest.ciol.com/images04/arrow.gif | | [Search by Issue](http://pcquest.ciol.com/archive/listArchive.asp) | [Sitemap](http://pcquest.ciol.com/general/sitemap.asp) | [Advanced Search](http://pcquest.ciol.com/content/search/advsearch.asp) | [http://www.pcquest.com/images04/Cybermedia25yrs.gif](http://www.cybermedia.co.in/) | | http://pcquest.ciol.com/images04/redcorner3.gif |
| http://pcquest.ciol.com/images04/redcorner5.gif | http://pcquest.ciol.com/images04/redtile.gif | http://pcquest.ciol.com/images04/redtile.gif | http://pcquest.ciol.com/images04/redcorner6.gif |
|  | | | |

|  |  |
| --- | --- |
| |  | | --- | | [http://pcquest.ciol.com/images04/rss1.jpg](http://feeds.feedburner.com/pcq-news) [RSS](http://feeds.feedburner.com/pcq-news) http://pcquest.ciol.com/images04/topheader_separator.jpg  **Connect with us** [http://pcquest.ciol.com/images04/gplus.jpg](http://plus.google.com/u/0/100514313924064567995)  [http://pcquest.ciol.com/images04/twetter1.jpg](http://www.twitter.com/pcquest)  [http://pcquest.ciol.com/images04/facebook1.jpg](http://www.facebook.com/pcquest)  [http://pcquest.ciol.com/images04/linkedin1.jpg](http://www.linkedin.com/groups?about=&gid=4040492&trk=anet_ug_grppro%20%3Chttp://www.linkedin.com/groups?about=&gid=4040492&trk=anet_ug_grppro%3E) | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | [Home](http://pcquest.ciol.com/) > [Technology](http://pcquest.ciol.com/content/technology/default.asp) | | http://pcquest.ciol.com/images04/techonolgy_lbl.gif | |  | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Intelligent Transportation using VANET  *Researchers are working on a Vehicular Adhoc Network to make transportation systems more intelligent so they can provide a driver with crucial info like road curves, traffic congestion, etc.*  Mainak Ghosh & Sumit Goswami, IIT, Kharagpur  Sunday, February 01, 2009   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | [[http://pcquest.ciol.com/images04/Print_icon.jpg](javascript:openWin('printer.asp'))Print](javascript:openWin('printer.asp')) | [[http://pcquest.ciol.com/images04/Comment_icon.jpg](http://pcquest.ciol.com/content/technology/2009/109020101.asp#comment)Comment](http://pcquest.ciol.com/content/technology/2009/109020101.asp#comment) | [[http://pcquest.ciol.com/images04/Email_icon.jpg](javascript:openWin('email.asp'))Email](javascript:openWin('email.asp')) | [[Digg](http://digg.com/submit?phase=2&url=http://pcquest.ciol.com/content/technology/2009/109020101.asp)Digg](http://digg.com/submit?phase=2&url=http://pcquest.ciol.com/content/technology/2009/109020101.asp) | [[Delicious](http://del.icio.us/post?v=2&url=http://pcquest.ciol.com/content/technology/2009/109020101.asp)Del.icio.us](http://del.icio.us/post?v=2&url=http://pcquest.ciol.com/content/technology/2009/109020101.asp) | [[Reditt](http://reddit.com/submit?url=http://pcquest.ciol.com/content/technology/2009/109020101.asp)Reddit](http://reddit.com/submit?url=http://pcquest.ciol.com/content/technology/2009/109020101.asp) | [[Twitter](http://twitter.com/pcquest)Twitter](http://twitter.com/pcquest) |  |  |  | | --- | |  |   Can vehicles be made intelligent enough to guide their drivers in situations like traffic congestion and accidents? Providing intelligence to vehicles means loading them with sensors which will be controlled by a telematics box inside the car. The box in turn would communicate with the driver and will be its guide. Vehicular Adhoc Network (VANET) is an important component of Intelligent Transportation Systems, which has a future potential in terms of a rich set of applications that it can provide to its customer.  VANET is a special class of Mobile Adhoc Networks (MANET), in which the nodes are the vehicles which communicate with other vehicles or with the base station which acts as a roadside infrastructure for using security and services application. Though the nodes are mobile in VANETs as well as MANETs, the mobility in VANET is constrained to the boundaries of the road unlike the nodes in MANETs, where movement is more random in nature. Nodes in VANET are also characterized by high node mobility and fast topology changes. Unlike MANET, power is not of great concern in VANETs as the vehicle batteries have sufficient and rechargeable power. The concept of network vehicle was first proposed by a team of engineers from Delphi Delco Electronics Systems and IBM corporation in the year 1998.  **Applications of VANET** The three major classes of applications possible in VANET are safety oriented, convenience oriented and commercial oriented. Safety applications will monitor the surrounding road, approaching vehicles, surface of the road, road curves etc. . They will exchange messages and co-operate to help other vehicles out under such scenario. Though reliability and latency would be of major concern, it may automate things like emergency braking to avoid potential accidents. Convenience application will be mainly of traffic management type. Their goal would be to enhance traffic efficiency by boosting the degree of convenience for drivers. Commercial applications will provide the driver with the entertainment and services as web access, streaming audio and video.   |  | | --- | | **Direct Hit!** | | Applies To: Developers USP: Learn applications of VANET Primary Link: None Keywords: VANET, Intelligent Transportation Systems |   **Safety Application:** Safety applications would be Slow/Stop Vehicle Advisor (SVA) in which a slow or stationary vehicle will broadcast warning message to its neighbourhood. Another similar type of application is emergency electronic brake-light (EEBL). In Post Crash Notification (PCN), a vehicle involved in an accident would broadcast warning messages about its position to trailing vehicles so that it can take decision with time in hand as well as to the highway patrol for tow away support. Road Hazard Control Notification (RHCN) deals with cars notifying other cars about road having landslide. Another related application would be road feature notification which deals with notification due to road curve, sudden downhill etc. Cooperative Collision Warning (CCW) alerts two drivers potentially under crash route so that they can mend their ways.  **Convenience Application:** Congested Road Notification (CRN) detects and notifies about road congestions which can be used for route and trip planning. TOLL is yet another application for vehicle toll collection at the toll booths without stopping the vehicles. Parking Availability Notification (PAN) helps to find the availability of slots in parking lots in a certain geographical area.   |  | | --- | | http://pcquest.ciol.com/2009/images/intelligent1_fed2k9.jpg | | Schematic Representation of a Vehicular Adhoc Network |   **Commercial Application:** Remote Vehicle Personalisation / Diagnostics (RVP/D) helps in downloading of personalized vehicle settings or uploading of vehicle diagnostics from/to infrastructure. Service Announcements (SA) would be of particular interest to roadside business like petrol pumps, highways restaurants to announce their services to the drivers within communication range. Content Map Database Download (CMDD) acts as a portal for getting valuable information from mobile hotspots or home stations. Using Real Time Video Relay (RTVR), on-demand movie experience will not be confined to the constraints of the home and the driver can ask for real time video relay of his favourite movies. More details of the applications is available at www.geocities.com /telbatt/Bai\_Aut onet06.pdf.  **Components of VANET enabled vehicle** The components of a VANET enabled Vehicle include computer controlled devices and radio transceivers for message exchange. The protocol that has been standardized for communication in VANET is DSRC, which has a communication range of 300 mts to 1 km. The roadside base station provides information to the driver throughout his journey so that he can find a best route to his destination. The information is periodically exchanged.  **Automotive Sensors for Position Verification:** Sensors in VANETS can be classified into two types: autonomous sensors and co-operative sensors. Autonomous sensors include Acceptance Range Threshold (ART), which is based on the observation that all radio networks have a maximum communication range, Mobility Grade Threshold (MGT) which is based on the assumption that the nodes can move only at a maximum speed, Maximum Density Threshold based on the assumption that only a restricted number of entities can reside in a certain physical area. These aim at preventing so called Sybil attack in which a node can create multiple copies of itself. Some other sensor includes map based verification overhearing etc. Cooperative sensors include techniques like proactive exchange of neighbour table to check if the positions received correspond to their own data and reactive position request where sensors co-operate on demand for position verification.   |  | | --- | | http://pcquest.ciol.com/2009/images/intelligent2_fed2k9.jpg | | Schematic Representation of a Vehicular Adhoc Network  Source: Leenand Hefferman, IEEE Computer, Jan 2002 |   **Communication:** The DSRC spectrum is divided into seven 10MHz wide channel. Channel 178 is the control channel which is restricted to safety communication. The extreme two channels on either side are reserved for accident avoidance application and high power public safety communication usages. The rest are used for both safety and non safety applications. The IEEE has proposed the following standards for VANETs: IEEE P1609.1, P1609.2, P1609.3 and P1609.4. IEEE P1609.1 is for Wireless Access for Vehicular Environments (WAVE) Resource Manager. It defines services and interfaces as well as message formats. IEEE P1609.2 is a standard for vehicular network security which includes message formatting, processing and exchange. IEEE P1609.3 defines routing and transport services and thus is an alternative to IPv6. IEEE P1609.4 provides specifications of the multiple channels in the DSRC standard. The WAVE stack uses a modified version of IEEE 802.11a known as IEEE 802.11p for its MAC layer protocol. It uses CSMA/CA as the basic medium access scheme. By using the orthogonal FDM system, it provides a communication range of 1 Km while taking into account high absolute and relative velocities, fast multi-path fading and different scenarios.  **Threats :** The prime concern that has plagued many VANET researchers is the security of these networks. Take an example of two cars moving on a single lane on a road. The car that is trailing behind can send a false message saying that there is a chaos ahead due to a crashed car. The car in front on receiving this message may believe this hoax to be true and take a detour leaving a less-traffic road for the malicious driver behind. This is one possible misuse of the several applications talked about here. Similar misuse can create havoc in systems where safety is of primary concern. An obvious solutions that has been looked into is asymmetric key based authentication. Few other possible attacks that have been considered as a threat to these networks are bogus information attack or disruption of network operation by jamming the wireless channel which leads to denial of service (DoS). There can also be attacks like cheating attack where identities, speed or position can be faked. Identity disclosure attack can be performed by a global observer who has an access to all the data gathered through these networks.   |  | | --- | | http://pcquest.ciol.com/2009/images/intelligent3_fed2k9.jpg | | Ref ; www.ieee802.org/802\_tutorials/march02/IEEE\_DSRC\_Stds\_Tutorial\_03-10-02.ppt |   **Security:** The main challenge in providing security in VANET depends on privacy, trust, cost and gradual deployment. Some existing security tools in some countries include electronic licence plates (ELP), which are cryptographically verifiable numbers equivalent to traditional license plates and help in identifying stolen cars and also keeping track of vehicles crossing country border, vehicular public key infrastructure (VPKI) in which a certification authority manages security issues of the network like key distribution, certificate revocation etc., event data recording by which important parameter can be registered during abnormal situation like accidents etc. Tamper proof hardware is essential for storing the cryptographic material like ELP and VPKI keys for decreasing the possibility of information leakage. To keep a tap on bogus information attack, data correlation techniques are used. To identify false position information, secure positioning techniques like verifiable multilateration is commonly used.  **Conclusion** VANET is definitely something to lookout for in the future. A lot of theoretical work has been put into realizing these networks and few experiments has been performed to validate this theory as cost of setting up this architecture is high, but more such efforts can be expected in near future. A successful vehicular network will open up a plethora of services to a huge number of audience which will turn out to be life saving as well as fun.  Page(s)   1 | | |  | | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | [[http://pcquest.ciol.com/images04/Print_icon.jpg](javascript:openWin('printer.asp'))Print](javascript:openWin('printer.asp')) | [[http://pcquest.ciol.com/images04/Comment_icon.jpg](http://pcquest.ciol.com/content/technology/2009/109020101.asp#comment)Comment](http://pcquest.ciol.com/content/technology/2009/109020101.asp#comment) | [[http://pcquest.ciol.com/images04/Email_icon.jpg](javascript:openWin('email.asp'))Email](javascript:openWin('email.asp')) | [[Digg](http://digg.com/submit?phase=2&url=http://pcquest.ciol.com/content/technology/2009/109020101.asp)Digg](http://digg.com/submit?phase=2&url=http://pcquest.ciol.com/content/technology/2009/109020101.asp) | [[Delicious](http://del.icio.us/post?v=2&url=http://pcquest.ciol.com/content/technology/2009/109020101.asp)Del.icio.us](http://del.icio.us/post?v=2&url=http://pcquest.ciol.com/content/technology/2009/109020101.asp) | [[Reditt](http://reddit.com/submit?url=http://pcquest.ciol.com/content/technology/2009/109020101.asp)Reddit](http://reddit.com/submit?url=http://pcquest.ciol.com/content/technology/2009/109020101.asp) | [[Twitter](http://twitter.com/pcquest)Twitter](http://twitter.com/pcquest) |  |   Sorry!! your browser does'nt support frames | | |  |  | | --- | --- | |  | | | http://pcquest.ciol.com/images04/prevarticles.gif | | |  | | | http://pcquest.ciol.com/images04/bullet.gif | [Telepresence: More Than Just HD Video Conferencing](http://pcquest.ciol.com/content/technology/2008/108120101.asp) | | http://pcquest.ciol.com/images04/bullet.gif | [New Technologies in Video Conferencing](http://pcquest.ciol.com/content/technology/2008/108110101.asp) | | http://pcquest.ciol.com/images04/bullet.gif | [Getting to the 'Core' of Processors](http://pcquest.ciol.com/content/technology/2008/108100301.asp) | | http://pcquest.ciol.com/images04/bullet.gif | [Making of a System-on-Chip](http://pcquest.ciol.com/content/technology/2008/108100302.asp) | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Top of Form   |  | | --- | | **Subscribe to our Newsletter** | | Name: | | Email Address: | |  |     Bottom of Form  http://pcquest.ciol.com/images04/PCQ_Pad1.jpg  **Subscribe to the Digital edition of PCQuest** [**On Zinio**](http://www.zinio.com/pcquest) **|** [**On Magzter**](http://bit.ly/PCQuestMag)  [PCQuest Fourm](http://forums.pcquest.com/) | |  | | |  |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  | [Magazine Subscription](http://www.pcquest.com/content/subscribe1.asp) | [RQS](http://pcquest.ciol.com/rqs/) | [Contact Us](http://pcquest.ciol.com/general/contact.asp) | [Team PCQuest](http://pcquest.ciol.com/general/pcquestteam.asp) | [Media Kit](http://www.ciol.com/mediakit/pcq/Default.aspx) | [jobs@cybermedia](http://www.cybermedia.co.in/careers" \t "_blank) |  | |  | |  | | --- | | http://pcquest.ciol.com/images04/footerline.gif | |  | |  | |  | |  |  |  | | --- | --- | --- | | [http://pcquest.ciol.com/images04/pcqlogo_sm.gif](http://www.pcquest.com/) | **Other CyberMedia web sites**  [[Dataquest](http://www.dqindia.com/)]   [[Voice&Data](http://www.voicendata.com/)]   [[CIOL](http://www.ciol.com)]   [[Living Digital](http://www.livingdigitalindia.com/)]   [[CMR India](http://www.cmrindia.com)]  <!--[[CIOL Shop](http://www.dqweek.com/content/guide/102101102.asp)]  -->[[DQ Channels](http://www.dqchannels.com/)]   [[the DQweek](http://www.dqweek.com/)]   [[CyberMedia India](http://www.cybermedia.co.in/)]  [[Global Services Media](http://www.globalservicesmedia.com)]   [[CyberMedia Events](http://www.cybermedia.co.in/corporate_events.asp)]   [[Cybermedia Digital](http://www.cybermediadigital.com/)]  [[CyberAstro](http://www.cyberastro.com/)]   [[BioSpectrum](http://www.biospectrumindia.com)]  [[BioSpectrum Asia](http://www.biospectrumasia.com)]  [[DARE](http://www.dare.co.in/)]  [[Computer Shopper](http://computershopper.com/)]   [[College Buying Guide](http://collegebuyingguide.com/)]   [[Technology Review](http://www.technologyreview.in/)] | [http://pcquest.ciol.com/images04/ciolnetwork_bot.gif](http://www.ciol.com/) | | [http://pcquest.ciol.com/images04/cmillogo_footer.gif](http://www.cybermedia.co.in/) | | | |  | | |  | | --- | | http://pcquest.ciol.com/images04/footerline.gif | | | |  |  | | --- | | Copyright © CyberMedia. All rights reserved. Reproduction in whole or in part in any form or medium without express written permission is prohibited. Usage of this web site is subject to terms and conditions. Broken links? Problems with site? Send email to [webmasterciol@cybermedia.co.in](mailto:webmasterciol@cybermedia.co.in?subject=From%20PCQuest%20Website) | |