IVHS AMERICA

# IVHS Architecture BULLETIN

January 1994 • No. 1

An Update of the Intelligent Vehicle-Highway System Architecture Development Program

## Inside:





A major program to develop a national IVHS architecture is under way. This Bulletin, published by the Intelligent Vehicle-Highway Society of America (IVHS AMERICA), is the first in a series designed to keep those who are interested informed of the program's progress to allow and encourage feedback on the developing architectures. The next Bulletin will be issued in April 1994.

# What is IVHS?

***the use of advanced computer, electronics and communication technologies that could increase the effectiveness of the entire surface transportation system.***

The Intelligent Vehicle-Highway System (IVHS) concept is based on the use of advanced computer, electronics and communications technologies to increase the effectiveness of the entire surface transportation system. Many of these technologies have already advanced other modes of transportation, such as aviation, and are now beginning to be used in surface transportation. IVHS technologies will be applied to all types of vehicles (trucks, buses and cars), to information devices (computers, kiosks, and hand-held devices), and to all parts of the surface transportation system (freeways, urban arterial roadways, city streets, rural roads and intermodal connections) in order to:

- *Improve Safety*
  By increasing information to the driver and augmenting driver control of the vehicle, IVHS can decrease traffic incidents and fatalities. Features include warning systems that activate when cars get too close to another vehicle or the edge of the road and enhanced traffic control systems that decrease stops and speed variations, reducing the number of accidents. Expected breakthroughs in collision-avoidance technology could substantially reduce entire classes of accidents.
- *Reduce Congestion and Improve Accessibility*
  IVHS technologies will reduce congestion through rapid detection and clearing of incidents that cause delays; enhanced public transit systems will reduce highway traffic; and real-time traffic control systems will adapt automatically to changing conditions and will improve the flow of traffic.
- *Improve Energy Efficiency and Environmental Quality*

  IVHS will provide travelers with information to support decisions that will smooth out highway demand and reduce travel time and vehicle emissions by providing opportunities to use high occupancy vehicles or public transit or to mitigate the need for travel altogether.
- *Enhance Economic Productivity*

  Congestion costs the US nearly $100 billion yearly in lost productivity. Traffic accidents cost roughly an additional $140 billion annually in lost wages and other direct costs. Together these total nearly 5% of the gross national product. Nearly $7 billion is spent by the government and truckers to enter and comply with commercial vehicle regulations. IVHS will improve transportation system efficiency through better routing of vehicles, automated toll collection, safety enhancements and streamlining commercial vehicle regulatory enforcement and compliance.

At the same time, the community that has coalesced to introduce IVHS can serve to meet broader institutional goals: create jobs by develop-

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## Goals of the IVHS Program

### Operational

- Improve safety
- Reduce congestion and improve accessibility
- Improve energy efficiency and environmental quality
- Enhance economic productivity

### Institutional

- Develop U.S. IVHS industry
- Revitalize the transportation profession
- Serve as a model for technology development and deployment

ing a major new domestic industry with an estimated market of $209 billion over the next 20 years; revitalize the transportation profession by transferring knowledge and resources from defense, aerospace and other advanced technology industries; and, serve as a model for future complex technology programs.

# IVHS User Services

The IVHS program will achieve its goals by implementing a number of diverse user services in the areas of Travel Planning, Traveler Information, Travel Management, Travel Payment, Commercial Vehicle Operations, Emergency Management, and Advanced Vehicle Control. (Note: The following list of user services and service areas have been abstracted from the first draft of the National IVHS Program Plan. The user services may be modified and the service areas may change as the Program Planning process proceeds.)

## Travel Planning

- *Pre-Trip Travel Information* will allow travelers access to a complete range of multi-modal transportation information at home, work, and other major trip sites. This information will be used to choose the mode of travel and departure time that aids the traveler in avoiding congestion,
- *Ride Matching and Reservation* will provide travelers with real-time ride-matching information along with reservations and vehicle assignments in car and van pools. This will help ease congestion and reduce pollution by encouraging increasing vehicle occupancy rates.

## Traveler Information

- *Enroute Transit Advisory* will provide travelers with real-time, accurate, transit and ride-sharing information while enroute to their destinations. This information will increase the attractiveness of transit to the traveler.
- *Enroute Driver Advisory* will provide the driver with in-vehicle information on incidents, roadway congestion, construction, and environmental hazards on the roadways. This information will enable the driver to select routes that avoid potential trouble spots.
- *Traveler Services Information* will provide "yellow pages" type information in the home, office, vehicle, and in public facilities on a variety of services including parking, car service/repair facilities, food, hotel, shops, hospitals, and police stations.
- *Route Guidance* will provide drivers of both commercial and personal vehicles with in-vehicle computer mapping and routing to their destinations. This will allow drivers to reach their destination more quickly and conveniently.

## Travel Management

- *Incident Management* will use sensors, data processing, and communications capabilities to identify a variety of incidents and formulate response actions to minimize the effects of those incidents.

## 27 User Services

### Travel Planning

- Pre-Trip Travel Information
- Ride Matching and Reservation

### Traveler Information

- Enroute Transit Advisory
- Enroute Driver Advisory
- Traveler Services Information
- Route Guidance

### Travel Management

- Incident Management
- Travel Demand Management
- Traffic Control
- Public Transportation Management
- Personalized Public Transit

### Travel Payment

- Electronic Payment Services

### Commercial Vehicle Operations

- Commercial Vehicle Preclearance
- Automated Roadside Safety Inspections
- Commercial Vehicle Administrative Processes
- On-Board Safety Monitoring
- Commercial Fleet Management

### Emergency Management

- Emergency Notification and Personal Security
- Public Travel Security
- Emergency Vehicle Management

### Advanced Vehicle Control

- Longitudinal Collision Avoidance
- Lateral Collision Avoidance
- Intersection Crash Warning and Control
- Vision Enhancement for Crash Avoidance
- Impairment Alert
- Pre-Crash Restraint Deployment
- Fully-Automated Vehicle Operation

- *Travel Demand Management* will reduce roadway vehicle demand by developing and encouraging travel modes other than the single occupancy vehicle. Congestion will decrease and environmental quality will improve by altering the nature, timing or location of a trip, or by eliminating a trip altogether.
- *Traffic Control* is an array of institutional, human, hardware and software components used to efficiently manage the movement of traffic on streets and highways. This includes the control of roadway signal systems to achieve specific objectives such as maximizing system throughput while minimizing delays, energy use, and air quality impacts.
- *Public Transportation Management* will enhance transit service operations through improved management of vehicles and facilities, planning and scheduling, services, and personnel management.
- *Personalized Public Transit* will provide flexibly routed transit services through the use of publicly or privately operated vehicles, increasing the attractiveness of transit to the traveler.

## Travel Payment

- *Electronic Payment Services* will allow travelers to pay for transportation services with electronic cards or tags. Electronic toll collection, transit fare payment and parking payment will be linked through an intermodal multi-use smart card system, increasing the convenience and efficiency of the overall transportation system.

## Commercial Vehicle Operations

- *Commercial Vehicle Preclearance* will allow commercial vehicles to take advantage of significant savings by passing checkpoints, ports-of-entry, weigh stations, and toll booths at regular speeds after vehicles are precleared as safe and legal.
- *Automated Roadside Safety Inspections* will improve the safety of commercial motor vehicle operations by providing safety inspectors with real-time access to the carrier's vehicle's, and driver's historical record; improving roadside inspection of brake performance; and using sensors and diagnostics to efficiently check vehicle systems and driver requirements.
- *Commercial Vehicle Administrative Processes* will streamline the regulatory process by allowing trucking and bus companies to electronically purchase and pay for vehicle registration and other motor carrier taxes and licenses; electronically capture mileage, fuel purchase, trip and vehicle data by state; and eventually "seamlessly" pre-clear the Mexican and Canadian borders.
- *On-Board Safety Monitoring* includes diagnostic and warning systems that will alert the commercial vehicle operator to pending emergencies while driving, improving commercial vehicle safety.
- *Commercial Fleet Management* will facilitate intermodal transfers of cargo and provide real-time traffic information to commercial vehicle dispatchers, increasing the efficiency of freight distribution.

## Emergency Management

- *Emergency Notification and Personal Security* will increase the safety and efficiency of emergency responses by using advanced technologies that would instantly send information on the location of a vehicle and the nature of an incident.
- *Public Travel Security* will involve an array of innovative technologies to improve the safety and security of public transportation, including protecting transit patrons and employees from street crimes, maintaining an environment of actual and perceived security, and developing innovative technical measures to respond to incidents.
- *Emergency Vehicle Management* will use advanced technologies (e.g., route guidance, signal priority) to assist those responsible for police services, emergency medical services, and fire services in reaching their destination more quickly.

## Advanced Vehicle Control

- *Longitudinal Collision Avoidance* will provide vehicle operators with automated assistance to avoid collisions to the front and/or rear of the vehicle.
- *Lateral Collision Avoidance* will provide vehicle operators with automated assistance to avoid collisions during lane changes, blind spot situations, and road departures.
- *Intersection Crash Warning and Control* will provide vehicle operators with automated assistance to avoid collisions at intersections.
- *Vision Enhancement for Crash Avoidance* will provide vehicle operators with assistance in avoiding collisions by enhancing the driver's vision with improved optics that provide the driver with enhanced night vision or sensors (e.g., radar or infrared) that provide auxiliary presentation of the driving environment during conditions of poor visibility.
- *Impairment Alert* will provide drivers with warnings regarding their fitness to drive, the vehicle's condition, and warnings about the roadway condition as sensed by the vehicle.
- *Pre-Crash Restraint Deployment* will aid in minimizing the injuries of collision victims through pre-contact restraint deployment (e.g., the air bag),
- *Fully-Automated Vehicle Operation* will allow vehicles to operate on an instrumented roadway without driver intervention, greatly increasing roadway capacity and safety.

# What is an IVHS Architecture?

*And why is it needed?*

***A framework that conceptually describes how components interact and work together to achieve total system goals***

System engineering methodologies have been created to develop and implement large multi-faceted systems like IVHS. These methodologies are commonly used in defense and aerospace programs and in technology-based commercial systems, such as computers and communications. The initial step common to the initiation of major new systems is the development of a system architecture.

A system architecture is the framework that describes how system components interact and work together to achieve total system goals. It describes the system operation, what each component of the system does and what information is exchanged among the components. An architecture is not hardware or software. Rather, an architecture is described on paper in the form of charts and accompanying narrative descriptions, similar to a flow chart for a computer program. Developing an architecture involves rigorous analysis of the costs and impacts of different architectural concepts.

A system architecture is different from a system design. Within the framework of an architecture, many different designs can be implemented. Using the analogy of a home stereo system, the architecture defines the functions of various components — receivers, compact disk players, etc. — and specifies their interconnection. Consumers are able to determine and implement their own system design. Whereas, one consumer may purchase a full range of high priced, high fidelity components, the consumer next door may choose instead to purchase a high quality receiver and a low end tape player. Because consumers are confident that the individual components they purchase will work together, product developers are assured of a market for their equipment — provided the components they offer adhere to the architecture's standards and are attractive to consumers. This allows product developers to focus their energy on developing higher quality and/or cheaper components, or to develop innovative new products (e.g., the digital audio tape or the mini-disc). The fact that an architecture has been established in the home stereo market has enabled the consumer to benefit greatly from product diversity and competition, while it has created a large market for home stereo suppliers.

An architecture can be either "open" or "closed." An architecture is open if the material documenting it is in the public domain. An open architecture encourages competition between multiple vendors, with their success determined by capability, cost, and innovation. A properly developed open architecture is modular, allowing for and facilitating the introduction of new technologies and system capabilities over time. Clearly, the home stereo system is the result of an open architecture. A closed architecture differs from an open architecture in that its supporting information usually is proprietary and, consequently, does not encourage competition among suppliers. From the perspective of a user, an open architecture is generally preferred, since it is likely to provide better capabilities and/or lower costs than products resulting from a closed architecture.

The development of an architecture is typically a top-down, systematic process. It involves an understanding of system goals, the functions and functional requirements necessary to achieve the goals, and the different operational concepts and enabling technologies that can be used to build a system that satisfies the functional requirements. The IVHS services can be thought of as the functional requirements of an IVHS architecture.

To implement the IVHS services, significant amounts of technology and information must be merged. These services relate to one another in the sense that all involve collection, transmission, processing, distribution and display of information. The same information may be common to different services, or system components may be designed to accommodate requirements for multiple services.

A well-defined IVHS architecture will accommodate different levels of implementation — different system designs — as well as provide guidance for integrating or upgrading existing systems in order to preserve current investments. This allows different goals to be supported across many regions — for example, different user services will be important to rural and urban areas.

In addition, the IVHS architecture should be an open architecture to:

- Foster evolutionary development of IVHS that readily accommodates new products as needs and goals change and technology advances;
- Reduce the cost of individual components by clearly defining their functions, encouraging competition by the private sector; and
- Identify necessary interfaces between components, an essential step toward defining common interface standards & protocols.

IVHS development is moving rapidly and products are already coming to market. Requirements for some areas are evolving in parallel with developments in others. The goal, nonetheless, is a well-integrated system in which the services are all linked practically and cost-effectively to provide greater capabilities than could be achieved separately. A thoughtfully designed IVHS architecture will ensure that the deployment of IVHS services occurs within the most sensible system framework. It will also ensure that a nationally compatible system emerges, instead of local or regional pockets of IVHS that will not accommodate intercity travel or cross-country goods movements.

## Selected Publications

**U.S. Department of Transportation**

- IVHS Strategic Plan Report to Congress
- NHTSA IVHS Plan
- Intelligent Vehicle Highway Systems Projects 1993
- Management Plan for FHWA' s IVHS Projects
- A Study of the Costs and Benefits of IVHS

**IVHS AMERICA**

- Strategic Plan for IVHS in the U.S.
- Federal IVHS Program Recommendations for FY 1994 and 1995
- Resource Guide for IVHS Contracting with Federal, State and Local Government Agencies
- ATMS-Seven Steps to Deployment
- APTS Vendor Catalog

For more information contact Andrea Vincent at 202-484-4247

## National IVHS Information Clearinghouse

The National IVHS Information Clearinghouse is a congressionally mandated repository of IVHS data. The clearinghouse is the primary on-line information system dedicated to serving the IVHS Community. Users can easily browse the database and conduct searches for information.

For more information contact Morris Bailey at:
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## IVHS AMERICA

IVHS AMERICA is a utilized Federal Advisory Committee and encompasses agencies and organizations consisting of government at all levels, the private sector, academia and surface transportation users. IVHS America is the partnership of these constituents and serves as a pro-active forum for identifying and accelerating the most appropriate technologies and strategies to foster the development and deployment of IVHS.

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# How is the IVHS Architecture Being Developed?

***USDOT initiated the National IVHS Architecture Development Program***

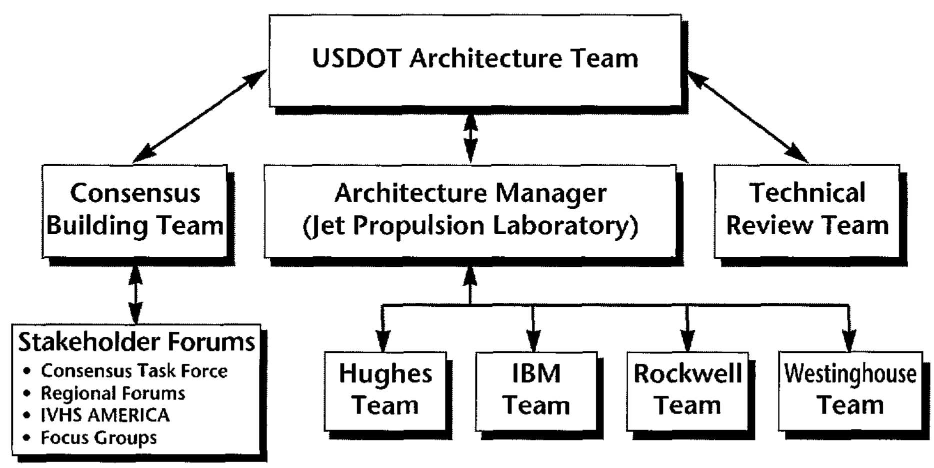
It is vital that the architecture be designed in a systematic fashion so that all issues are addressed openly and directly, rather than having the architecture evolve in a ad hoc fashion. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) gives USDOT the responsibility of providing the leadership and guidance necessary to ensure national IVHS compatibility over the long term. That compatibility relies upon establishing a unifying national IVHS architecture.

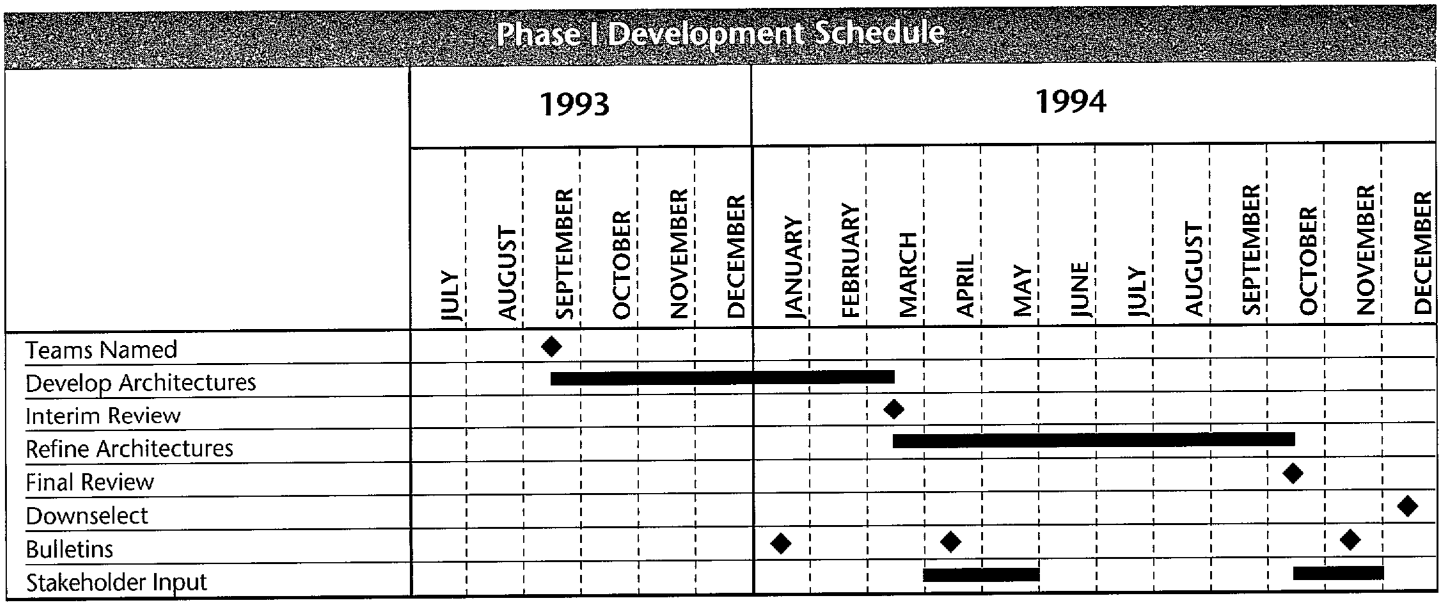
IVHS AMERICA formally recommended a system architecture development methodology to USDOT that utilizes efforts of concurrent multi-disciplinary public/private/academic teams. It requires contributors from many disciplines, including transportation analysts; systems engineers; and specialists in communications, information systems, infrastructure technologies, vehicle dynamics, data management, simulation, and modeling. Simulation and modeling are especially valuable for providing early indications of a user services cost/benefit ratio, and thus early indications of the desirability of continuing to pursue development of a particular service.

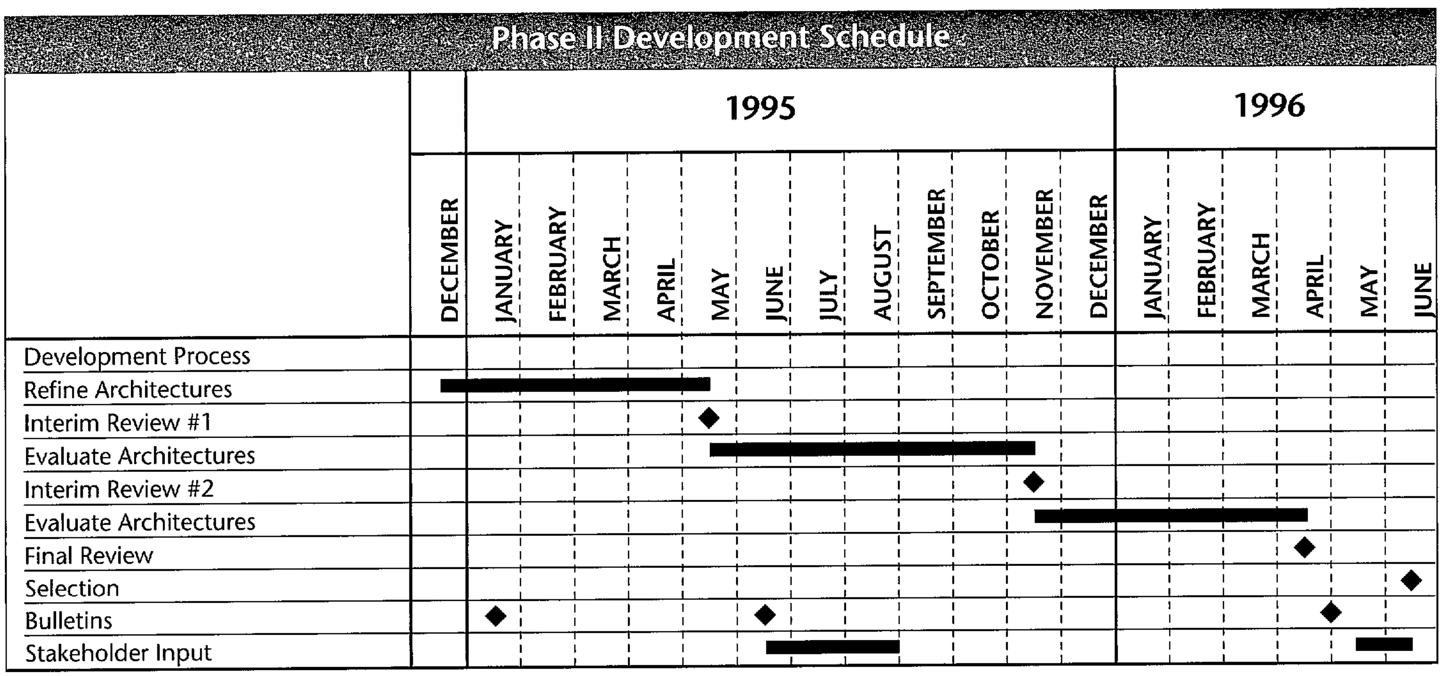
USDOT has initiated the National IVHS Architecture Development Program to develop the needed IVHS architecture. The program tracks with IVHS AMERICA's recommendation and will proceed in two phases. Based on proposals submitted in April 1993, USDOT has selected consortia led by Hughes Aircraft, IBM, Rockwell International, and Westinghouse Electric to each develop an alternative IVHS architecture. Phase I will last 15 months from September 1993 to December 1994 and will result in multiple architecture definitions (See Phase I Schedule). The consortia with the most promising architectures will continue into Phase II. Lasting 19 months from December 1994 to July 1996, Phase II will focus on detailed evaluation of the remaining alternatives (See Phase II Schedule). Throughout both phases, the consortia will have the opportunity to refine their architectures as they gain further knowledge and insight. At the conclusion of Phase II in mid-1996, a national IVHS architecture will emerge.

Management of the Architecture Development Program is vested in the USDOT Architecture Team, comprised of representatives from USDOT's Federal Highway Administration, Federal Transit Administration, and National Highway Traffic Safety Administration (see Program Structure). The Jet Propulsion Laboratory has been

## Program Structure






selected by USDOT to serve as the Architecture Manager, providing day-to-day management oversight of the consortia.

A consensus building team, staffed jointly by USDOT and IVHS AMERICA, will transmit information to and receive feedback from interests outside the technical development program.

A team of technical experts—the Technical Review Team (TRT)—will review the technical soundness of the architecture alternatives submitted by the teams at certain program milestones.

## Architecture Approaches

The four architecture development teams each have a distinct approach. The teams have developed summaries describing their approach. These descriptions are being disseminated by the U.S. Department of Transportation in the interest of providing preliminary information regarding the architecture development efforts. These summaries have been taken verbatim from material supplied by the architecture development teams. USDOT has not verified or endorsed the information contained in these descriptions.

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## Hughes Aircraft

The Hughes Team approach proposes a balancing of intelligence and cost between the vehicle and the infrastructure. A range of price/performance products and services provides route selection and guidance to the traveler, and traffic congestion and incident detection data to the Traffic Management Center.

Route selection services will be provided as a service, or by in-vehicle navigation equipment. Route guidance will be implemented in the vehicle. The underlying theme is a driver/traveler orientation.

Traffic congestion and incident detection data are provided by a combination of the vehicle acting as a "probe" and infrastructure providing advanced technology equivalents to loops.

The means for communicating between vehicle and infrastructure is primarily by short range rf between the vehicle and roadside beacons. Other communications technologies, particularly cellular phone and fiber optic land-lines, will be used where applicable.

Public transportation management and traffic management are integrated, with both using a common fiber-optic communication system and mutual access to the traffic database.

Private sector involvement is a major element in the Architecture.

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## IBM

The IBM Team approach will create a national IVHS architecture that provides the complete set of user services required for the 21st century. The physical IVHS system will consist of advanced, centralized, regional Traffic Management Centers (TMCs) linked to each other by high speed wide area networks (WANs). Operationally the regional TMCs will provide human and automated traffic management services, as well as seamless user services, both within a region and across multiple regions as necessary. The strengths of the IBM Team's architecture lie in its ability to simultaneously address the safety, efficiency, and service requirements of IVHS.

The TMC will have complete information on all traffic conditions within its region. This enables intelligent coordination of traffic management with functions like optimal route selection, incident reporting, and information distribution to the public on current and projected traffic conditions. The TMC will provide optimal traffic management, while also providing the most timely and accurate information to the traveler. Linking regional TMCs together via WANs will allow information to be transmitted and accessed across regions, enabling services like pre-trip planning to be provided on a real-time basis for users crossing regional boundaries.

The IBM Team's IVHS architecture is open and expandable; for example, roadside beacons, digital cellular communications, and other wireless technologies are all proposed to support communication with individual vehicles. Different communications systems, including future technologies, can all be used to provide consistent user services across widely varying regions. The services will be provided transparently to the traveler, regardless of the type of communication systems used in a particular area, as standards are put in place to ensure compatibility between different geographic regions and technologies.

As the architecture is deployed, an ever increasing number of user services will become available. Information will be accessible at home, work, public places and in the vehicle, through media such as interactive TV, computer services, kiosks, or in-vehicle devices. This information will be actively coordinated with traffic management to insure not only safety, service, and convenience for the individual, but also to insure maximum service from the entire system.

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## Rockwell International

The Rockwell Team approach stresses an unbiased, balanced approach. Nontechnical/socio-economic, deployment, and technical issues are given equal emphasis in the design tradeoffs. The proposed architecture provides an accommodative, open framework to support user service functionality while meeting the requirements of the service developers/implementors, operators/maintainers, and users. User service functionality is distributed across modular subsystems. The modular subsystems are defined in an implementation independent manner and structured to present a general purpose interface to the remainder of the system. This permits utilization of existing infrastructure (i.e., use of an existing Traffic Management Center [TMC]), allows jurisdictional preference in specific implementations, supports scalability through replication as needs expand, and permits upgrades through minimization of architecture sensitivity to technological variability and evolution. Flexibility in the distribution of user functionality within the infrastructure, through transparent sharing of local/shared databases, permits a range of centralized and/or distributed processing and control options, supporting various implementations of TMCs, as well as public/private implementations of Traveler Information Systems (TIS). Distributed, modular subsystems have the added advantage of enhanced reliability, maintainability, and graceful degraded system operation due to subsystem failure.

The Rockwell Team's architecture is structured to support a broad range of communications media and protocol implementations. Communication interface subsystems are defined to isolate the communications implementation methodology from the architecture. This minimizes the impact of modifying or upgrading a particular communications implementation which supports a user service functionality or group of functionalities. The architecture promotes the use of existing communication infrastructures whenever feasible. It capitalizes on the financial investments being incurred by the telecommunications industry to develop and deploy new technologies and infrastructures.

The Rockwell Team's architecture allocates position location, trip planning/route selection, MAYDAY message generation, and route guidance to the vehicle. Selection of routes and route guidance would be supported by traffic information from a TMC or an independent traffic service provider. By decentralizing these functions, control of route selection is in the hands of each individual traveler, allowing these user services to be tailorable to the user needs. Information would be communicated to the traveler through a wireless medium. A basic set of services, including MAYDAY and in-route traveler advisories, would be available to all minimally equipped vehicles, with additional user functionality being supported by a combination of more elaborate user equipment and pay-for-use communication services. The infrastructure to vehicle communications interface would be standardized to achieve seamless, nationwide interoperability.

The Rockwell Team's architecture approach seeks a balance between the use of public transportation and private vehicles. There is a strong emphasis on the application of technology within vehicle, infrastructure, and the information media to improve safety and relieve congestion.

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## Westinghouse Electric

The Westinghouse Team approach is to increase the people and traffic throughputs to solve the near and mid-term transportation problems while laying out the necessary foundation for advanced technology applications in the far term. Highlights of this architecture's features are as follows:

*Maximize people-carrying capacity of the transportation system by enhancing transit and paratransit operations.* This concept is supported by: (1) a real-time transit traveler information system; (2) an advanced dispatch system with two-way communications; (3) smart cards to enhance the system's efficiency, user's convenience, and the ease of intermodal travel; and (4) energy-efficient vehicles to reduce operating and maintenance costs, and pollution emissions.

*Provide cost-effective methods for traffic monitoring and surveillance.* The proposed architecture will accommodate a variety of traffic detection techniques including both localized and areawide detection devices, as well as vehicle probes and human reports.

*Minimize in-vehicle equipment requirements and costs to promote widespread usage of traveler advisory information.* Since about 88 percent of Americans drive to work, economical means for these people to access the traveler advisory information are vital to combating traffic congestion and enhancing highway safety. Sophisticated traveler information systems (such as route guidance and route selection) will also be available to those who are willing to pay for the service (e.g., local delivery fleet, taxis, and tourists).

*Provide low-cost solutions for transmitting MAYDAY signals and locating distress vehicles.* Early detection of traffic incidents are critical in reducing non-recurring congestion. The low-cost MAYDAY feature enables a wide-spread deployment of the service in both urban and rural areas, thus enhancing the timely detection of incidents and increasing traveler's safety. The MAYDAY system will be supported by a coordinated emergency response operation to maximize the effectiveness of incident management.

*Preserve the operational autonomy of individual organizations involved in transportation while enhancing inter-organization coordination.* Various jurisdictions, agencies, and organizations (public and private) can contribute and receive transportation information to enhance their individual operations. The coordination concept is based on accomplishing four major interrelated functions: (1) intermodal passenger transportation management; (2) congestion and incident management; (3) HAZMAT tracking and emergency management; and (4) commercial vehicle operations regulatory support.

*Maximize opportunities for public/private partnership in IVHS infrastructure investments.* The architecture supports an integrated transportation information system that enables the delivery of all user services. This system presents opportunities for public/private partnership to share the IVHS investment costs.

*Maximize opportunities for privatization of relevant IVHS user services.* The architecture facilitates the establishment of a variety of traveler services centers to support personal as well as commercial transportation needs at both the local and interstate level.

# How Does One Participate?

***A consensus building process has been initiated to gain cooperation among stateholders***

During the architecture development program, the key to success will be involving major stakeholders-those directly affected or influenced by the introduction of IVHS-in the decision-making process. Those who will use, design, build, operate, maintain, and be impacted by these systems must jointly decide upon a common system architecture. To involve these stakeholders, a consensus building process has been initiated to gain cooperation among many classes of stakeholders in achieving the goal of a nationally compatible intelligent transportation system.

For IVHS, a consensus building effort is essential. IVHS has many stakeholders with differing-often competing-interests. Since critical policy issues will be addressed by architecture alternatives, the consensus building process will allow-and ensure-stakeholders are aware of these policy issues and are able to provide meaningful feedback and input as it relates to these issues. The process is intended to help shape the resulting IVHS architecture to meet the needs of the stakeholders in a balanced fashion.

Working with many other organizations, USDOT and IVHS AMERICA will jointly manage the consensus building process. Consensus building activities will focus around the interim and final program reviews. These review "cycles" are scheduled for April-May 1994, October-December 1994, June-August 1995, and April-June 1996. At these points the latest information on the developing alternatives, along with mechanisms to provide feedback, will be made available to the stakeholders through a series of different stakeholder forums. These forums are:

- *IVHS Architecture Consensus Task Force:* Comprised of approximately 40 IVHS stakeholders, primarily associations/societies and interest groups, Task Force members will transmit information to and present feedback from their constituents' perspectives. Representation on the Task Force is expected to evolve as the program progresses. (See IVHS Architecture Consensus Task Force).
- *Regional Architecture Forums:* After each major review, public meetings will be held in the ten USDOT regions to present the current status of the architecture alternatives and allow local feedback (see Dates and Locations of Regional Architecture Forums).
- *IVHS AMERICA:* The technical committees and regional affiliates of IVHS AMERICA will be provided with information and will generate feedback on the architecture alternatives. (See IVHS America Committees).
- *Focus Groups:* As appropriate, focus groups will be conducted to provide a better understanding of key issues and the views of key stakeholders.

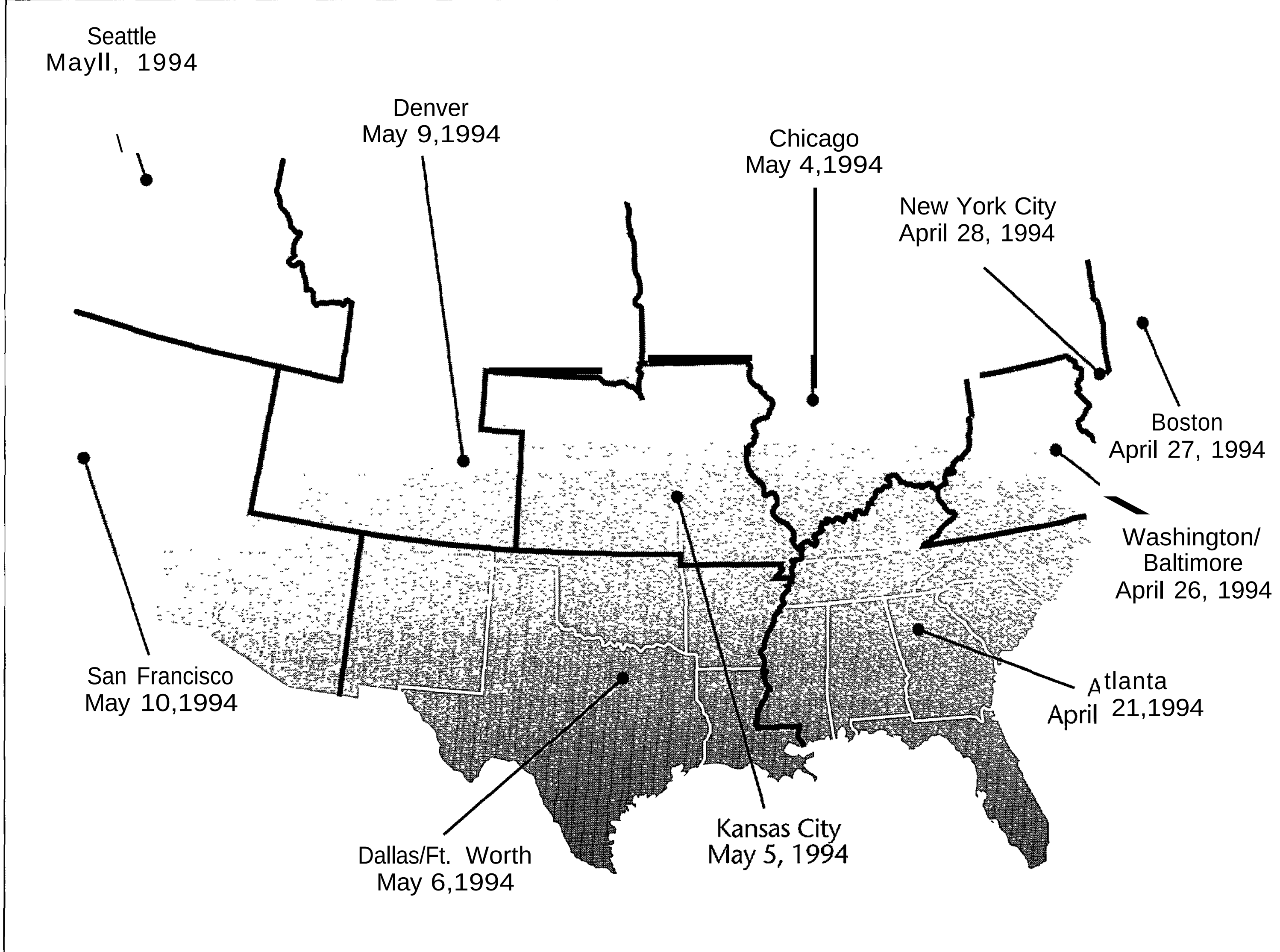
Feedback from these forums will be used to refine the architecture alternatives. Feedback provided in the first two review cycles will also be factored into the process of selecting which teams continue on into Phase II. Feedback provided in the last two review cycles will help determine which of the remaining alternatives will be chosen as the national IVHS architecture.

The consensus building process will not seek to obtain total agreement by all stakeholders on all facets of the selected architecture; rather the aim is to develop general support within the broad stakeholder community behind the ultimate national architecture.

***The process is in tended to help shape the resulting IVHS architecture to meet the needs of the stakeholders in a balanced fashion.***

| IVHS Architecture Consensus Task Force |
|---|
| American Association of Motor Vehicle Administrators |
| American Association of State Highway and Transportation Officials |
| American Association of Port Authorities |
| American Association of Retired Persons |
| American Automobile Association |
| American Automobile Manufacturers Association |
| American Bus Association |
| American Consulting Engineers Council |
| American Electronics Association |
| American Portland Cement Alliance |
| American Public Transit Association |
| American Public Works Association |
| American Road and Transportation Builders Association |
| American Trucking Associations |
| Association of American Railroads |
| Council of Standards Organizations |
| Council of University Transportation Centers |
| Electronic Industries Association |
| Environmental Defense Fund |
| Human Factors and Ergonomics Society |
| Institute for Transportation Engineers |
| International Bridge, Tunnel and Turnpike Authority |
| International Taxicab and Livery Association |
| National Association of County Officials |
| National Association of Governors Highway Safety Representatives |
| National Association of Regional Councils |
| National Conference of State Legislatures |
| National Emergency Numbers Association |
| National Governors Association |
| National industrial Transportation League |
| National League of Cities |
| National Private Truck Council |
| National Safety Council |
| Public Technology, Incorporated |
| State and Territorial Air Pollution Program Administration/Association of Local Air Pollution Control Officials |
| Surface Transportation Policy Project |
| Telecommunications Industries Association |
| United Bus Owners of America |
| United States Chamber of Commerce |

## Dates and Locations of Regional Architecture Forums




## IVHS AMERICA Committees

- Advanced Public Transportation Systems
- Advanced Rural Transportation Systems
- Advanced Traffic Management Systems
- Advanced Traveler Information Systems
- Advanced Vehicle Control Systems
- Benefits, Evaluation and Costs
- Commercial Vehicle Operations
- Energy and Environment
- Institutional Issues
- Legal Issues
- Safety and Human Factors
- Standards & Protocols
- System Architecture
- Societal Implications Task Force
- Travel Demand and Telecommunicating Task Force

# Information Request Form

▒ Yes, I want to be kept informed of progress in the IVHS Architecture Development Program. Please put me on the mailing list for the ***IVHS Architecture Bulletin.***

▒ YES, I want information on the first series of Regional Architecture Forums. (Check all that apply)

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- ☐ 2. Washington/Baltimore April 26, 1994
- ☐ 3. Boston, April 27, 1994
- ☐ 4. New York City, April 28, 1994
- ☐ 5.Chicago, May 4, 1994
- ☐ 6. Kansas City, May 5, 1994
- ☐ 7. Dallas/Ft. Worth, May 6, 1994
- ☐ 8. Denver, 9, 1994
- ☐ 9. San Francisco, 10, 1994y
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My interests in IVHS are:

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**Fax or mail your request to:**

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