



International Review of the ITS System Architecture

Increasing Need for “Integration” Around the Globe

- ◆ Rising economic activities and urbanization has lead to significant congestion on transportation network
- ◆ Transportation networks are more complex
- ◆ Organizations are more interrelated and exchange of information is essential
- ◆ Systems are more interconnected and interdependent
- ◆ Travellers expect consistent services



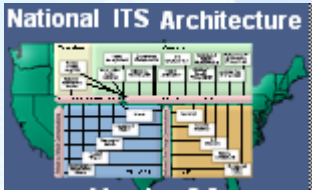


International Reviews

- ◆ **U.S.**
 - ◆ **Canada**
 - ◆ **Europe**
 - ◆ **Australia**
 - ◆ **Japan**
 - ◆ **Taiwan**
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U.S. National ITS Architecture

◆ National ITS Architecture



- First version released in 1996
- Latest version 6.0 released in April 2007

◆ Turbo Architecture



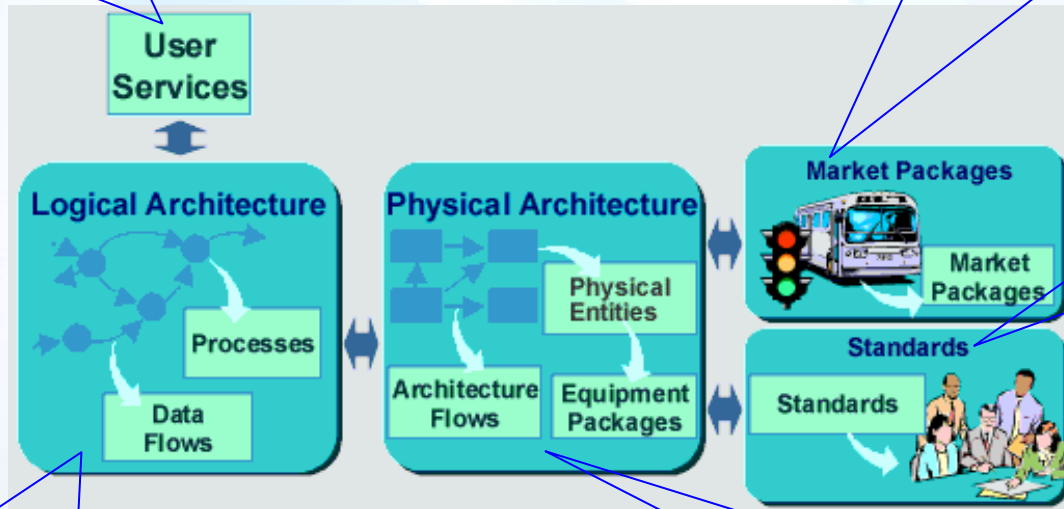
- Software application that supports development of regional / project architecture
- Version 4.0 is expected to be available in October 2007

Structure of US National ITS Architecture

Defines the required ITS needs and describes what the system will do from the user's perspective

Identifies pieces of Physical Architecture for a particular ITS service

Set of guiding standards to achieve interoperability and compatibility



Defines the functions and information flows to support the user services

Assigns the process from Logical Architecture to physical entities

US National ITS Architecture

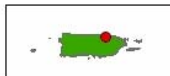
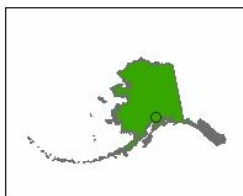
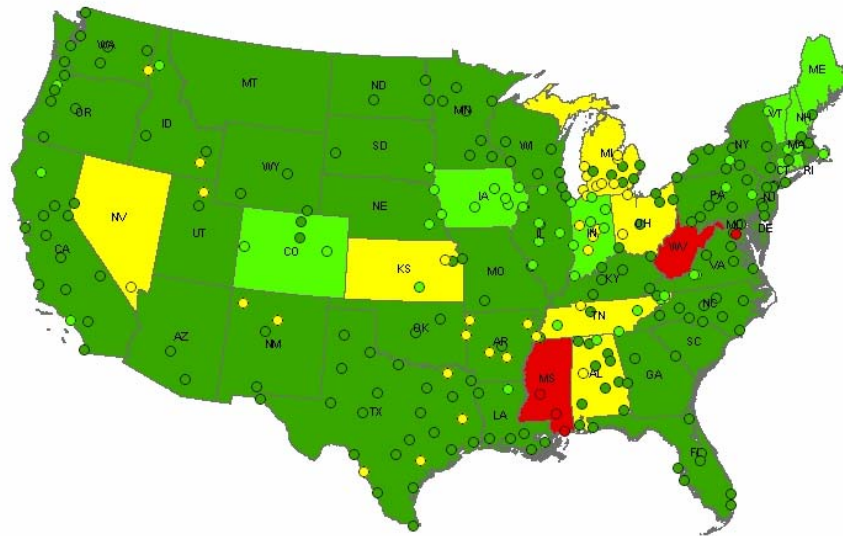
Development & Implementation

- ◆ ITS projects funded by Highway Trust Fund / Mass Transit Fund must be in conformance with the U.S. National ITS Architecture
 - ◆ ITS Architecture Implementation Program established by FHWA provides:
 - Guidance and recourses documents
 - Peer Exchange Programs using examples of successful cases in deploying ITS projects using the ITS Architecture
 - Field Support Team and training programs for the TURBO Architecture
 - ◆ Establishment of Regional ITS Architectures
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US National ITS Architecture

Development of Regional ITS Architectures in U.S.

Statewide and Regional Architecture Development
(as of 03/31/2005)



Regional Architecture	Statewide Architecture
● Not Needed/Ready for Use	■ Not Needed/Ready For Use
● Ready by April 05	■ Ready By April 05
● Not Done by April 05 - No Impact	■ Not Ready by April 05 - No Impact
● Not Done by April 05 - Possible Impact	■ Not Ready by April 05 - Possible Impact

Canadian ITS Architecture

- ◆ Developed based on Version 3 of the U.S. National ITS Architecture with consideration of the Canadian context
- ◆ Specific Canadian issues included:
 - level of population dispersion
 - bilingual language considerations
 - extreme climate
 - communications industry and regulatory considerations
- ◆ Released in 2000



Canadian ITS Architecture

- ◆ 35 User-Services were identified
 - ◆ Of the 35 User-Services, 6 were newly introduced to the Canadian ITS Architecture:
 - Operations and Maintenance
 - Automated Dynamic Warning and Enforcement
 - Non-Vehicular Road User Safety
 - Intermodal Freight Management
 - Disaster Response and Management
 - Weather and Environmental Data Management
 - ◆ Some of the changes made for Canada were included in Version 4 of the U.S. National Architecture`
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Canadian ITS Architecture

Development & Implementation

- ◆ Series of training program were carried out across Canada
 - ◆ Training program includes:
 - Executive level session introduces the Architecture at a high level
 - Detailed workshop examines the Architecture in more depth and details the roles, structure, concept, and application of the Architecture
 - ◆ Plan to specify the conformance with the ITS Architecture as a pre-requisite for government funded projects
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Border Information Flow Architecture (BIFA)

- ◆ BIFA was developed by U.S. Department of Transportation **FHWA** and **Transport Canada**, in partnership with state and provincial transportation agencies
- ◆ BIFA supports the planning, development, and implementation of ITS and other technology-based solutions at the U.S.-Canada border



Border Information Flow Architecture (BIFA)

- ◆ BIFA includes all services that support border operations and management of the transportation system surrounding the border
- ◆ Geographical scope: encompasses the international border between the U.S. and Canada



- ◆ Addresses both major land border crossings as well as rural border crossings and ferry terminals

European ITS Architecture

- ◆ European Union (EU) has been active in system architecture since early '90s
 - ◆ A common ITS Architecture Framework for EU countries
 - ◆ Ensures a consistent level of service to citizens throughout EU
 - ◆ Allows ITS systems from different countries to interact easily with each other
 - ◆ Ensures compatibility of equipment with different infrastructures and enables seamless travel across Europe
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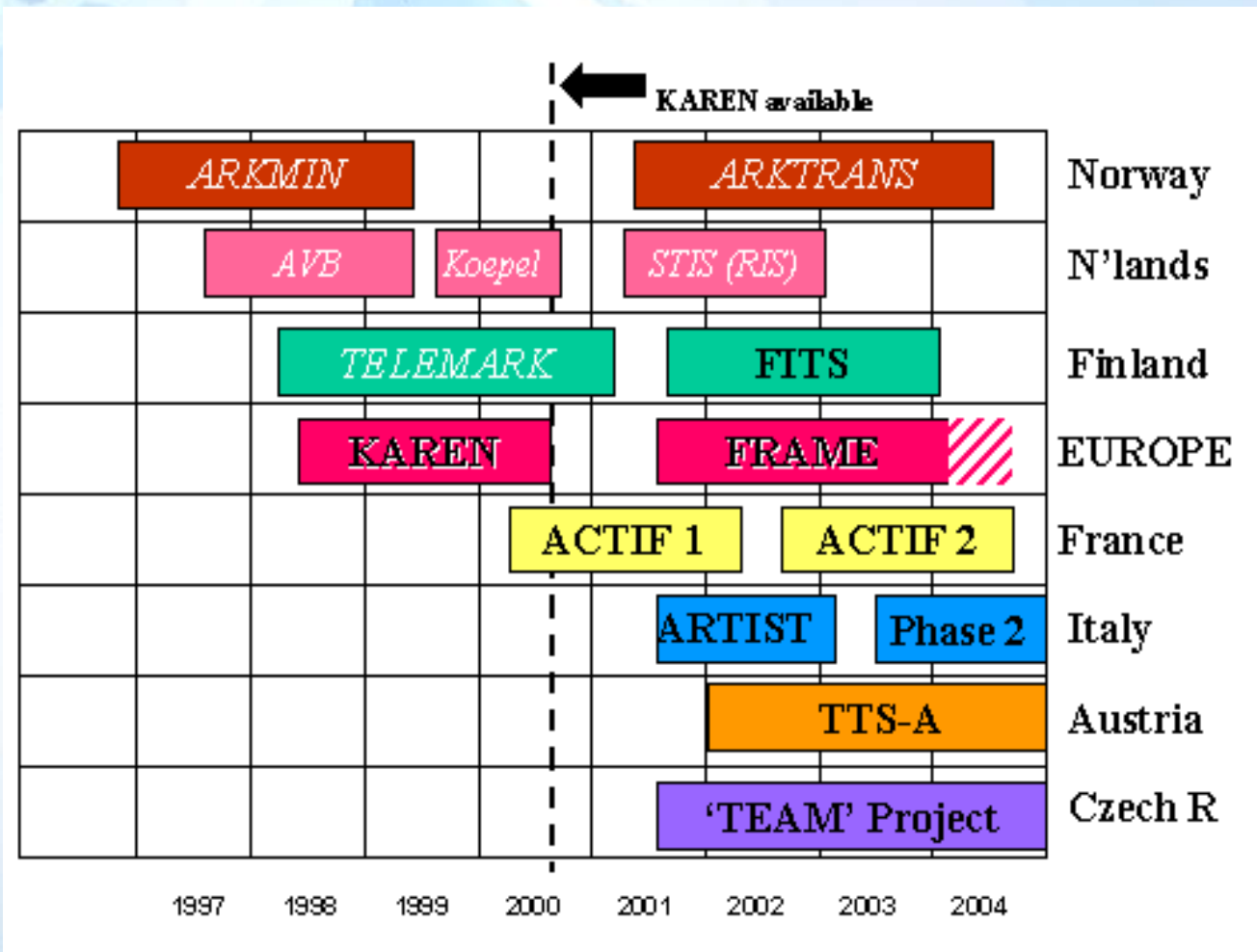
European ITS Architecture

- ◆ First version released in 2000 under the “KAREN” Project
 - ◆ KAREN - Keystone Architecture Required for European Networks
 - ◆ Version 3 released in 2004 under the “FRAME” Project
 - ◆ FRAME - FRamework Architecture Made for Europe
 - ◆ Provides a “Tool-box” for the development of ITS deployments at a national, regional or local level for EU countries
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Structure of European ITS Architecture

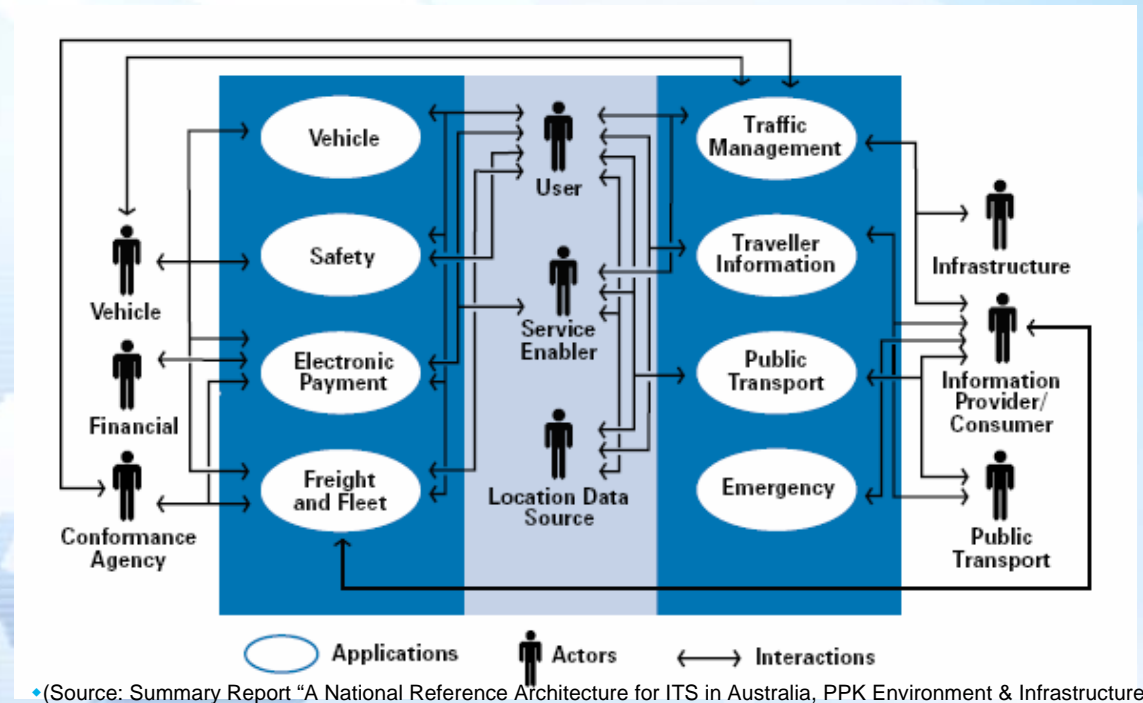
- ◆ User Needs
 - Define high level user requirements on various ITS fields
 - ◆ Framework Architecture
 - Functional Architecture
 - Defines Functionality to fulfill User Needs
 - Physical Architecture
 - Identifies actual Applications to fulfill User Needs
 - Communication Architecture
 - Identifies Data flows between Applications and outside world
 - ◆ Supporting Documents
 - Documents supporting architecture users to develop, implement and promote their architectures
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Development of ITS Architecture in Europe



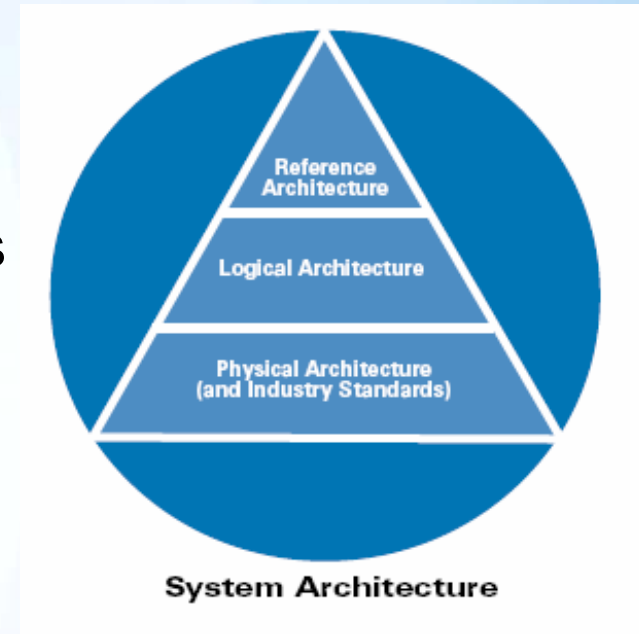
ITS Architecture for Australia

- ◆ Released in 1999
- ◆ Three key concepts to describe the extend of the system and how it is intended to work:
 - Applications
 - Actors
 - Interactions



Structure of ITS Architecture for Australia

- ◆ Reference Architecture
 - Provides broad concepts and the required inter-relationships
- ◆ Logical Architecture
 - Defines in details the inter-relationships between users and systems
- ◆ Physical Architecture
 - Describes in details how each module within the system interacts



ITS Architecture for Japan

- ◆ Released in 1999
 - ◆ Developed by VERTIS
(Vehicle, Road and Traffic Intelligence Society)
 - ◆ Nine development areas:
 - Advances in Navigation Systems
 - Electronic Toll Collection Systems
 - Assistance for Safe Driving
 - Optimization for Traffic Management
 - Increasing Efficiency in Road Management
 - Support for Public Transport
 - Increasing Efficiency for Commercial Vehicle Operations
 - Support for Pedestrians
 - Support for Emergency Vehicle Operations
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Structure of ITS Architecture for Japan

- ◆ User Services
 - Defines ITS services
 - ◆ Logical Architecture
 - Defines the interrelation of information
 - ◆ Physical Architecture
 - Develops optimum systems in terms of functions and information sharing
 - ◆ Standardization Candidate Areas
 - Standardizes interface between ITS elements
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ITS Architecture for Japan

- ◆ 21 ITS User Services
- ◆ Different projects are defined based on the Architecture
 - e.g. 10 projects defined by UTMS (Universal Traffic Management Society)

- AMIS: Advanced Mobile Information Systems
- DRGS: Dynamic Route Guidance Systems
- DSSS: Driving Safety Support Systems
- EPMS: Environmental Protection Management Systems
- FAST: Fast Emergency Vehicle Preemption Systems
- HELP: Help Systems for Emergency Life Saving and Public Safety
- IIIS: Intelligent Integrated ITV Systems
- ITCS: Integrated Traffic Control Systems
- MOCS: Mobile Operation Control Systems
- PTPS: Public Transportation Priority Systems



ITS Architecture for Taiwan

- ◆ National Intelligent Transportation Infrastructure (NITI)
 - ◆ Released in 2002
 - ◆ Developed by MOTC
(Ministry of Transportation and Communications)
 - ◆ Similar Structure as the U.S. ITS Architecture:
 - User Services
 - Logical Architecture
 - Physical Architecture
 - Communication Architecture
 - Market Packages
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Development & Implementation

- ◆ e-Transportation Program
 - Budget of US\$ 46 million
 - Apply technologies to improve utilization of current transportation systems
 - Develop advanced ITS technologies
- ◆ Proposed Expenditure on ITS
(2004-2010 ~US\$ 330 million)

1	Advanced Traffic Management Services, ATMS	NT\$ 8,347 million
2	Advanced Traveler Information Services, ATIS	346 million
3	Advanced Public Transportation Services, APTS	1,046 million
4	Commercial Vehicle Operations Services, CVOS	214 million
5	Electronic Payment Services, EPS	815 million
6	Emergency Management Services, EMS	26 million
7	Vulnerable individual protection services, VIPS	79 million
8	Advanced vehicle control & safety services, AVCSS	51 million
9	Information management services, IMS	4 million
	Total	NT 10,927 million

Benefits for an “Integrated” Transportation Network

- ◆ *Promotes unity and ensures inter-operability* in the deployment of ITS
- ◆ Enhance *productivity and competitiveness*
- ◆ Increase *operational efficiency and capacity* of the ground transportation system
- ◆ *Reduce energy and environmental costs* associated with ground transportation
- ◆ Improve the *collection of information and data* for policy making, planning, program management and evaluation, traffic operations, enforcement and congestion monitoring

