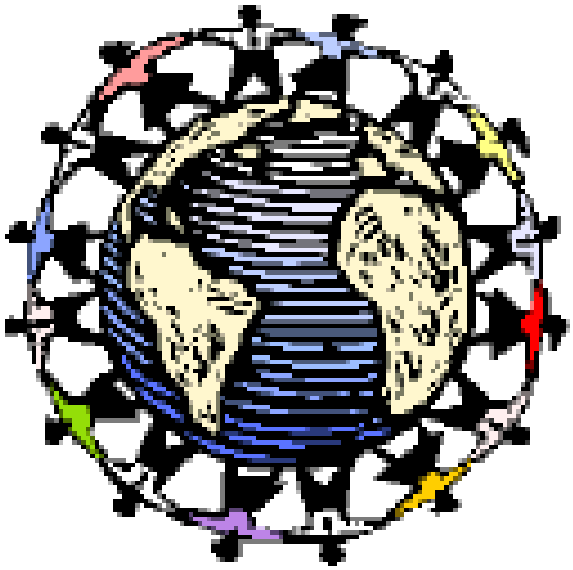
Kansas Department of Transportation

GeoSpatial Enablement Strategy Appendix 6 – Existing Business Systems and Workflows



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Appendix 6 Existing Business Systems and Workflows

Appendix 6 contains a comprehensive review of the business systems that will be involved or affected by the geospatial enablement initiative. The systems are:

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2. Contract Management System (CMS)
3. CANSYS II/Exor Highways
4. Pavement Management Information System (PMIS)
5. Network Optimization System (NOS)
6. GIS Data Warehouse (GIS/DW)
7. KGATE
8. Kansas Accident Records System (KARS)
9. KANROAD
10. Truck Routing Information System (TRIS)
11. TerraShare
12. KCScout
13. ATIS

1.1 Comprehensive Project/Program Management System (CPMS)

The Comprehensive Project/Program Management System (CPMS) provides project and fund planning, monitoring and closure information for construction projects and for all projects, which the agency chooses to establish for the purpose of planning and monitoring KDOT's work. CPMS replaced KDOT's previous project management system, the Resource Management System (RMS), in 1992. Since the initial start-up date in May of 1992, CPMS has continued to evolve as the agency has established business practices and procedures for using CPMS and identified necessary modifications and refinements.

The CPMS User Manual contains instructional and operational material about CPMS. It reflects all CPMS modifications since the initial start-up of CPMS, including the latest work package implemented September 26, 1997. The manual does include the background, reference and base material that a user needs to know in order to successfully navigate CPMS and understand the information presented.

During August through September of 2004 a series of interviews were conducted with various KDOT users of CPMS. In these interviews respondents were asked a series of questions pertaining to their business process, customers, and the CPMS system. While there is a wealth of information provided in these surveys only a portion of it is relevant to the GE initiative. Table 1 provides a synopsis of the most salient points obtained from the surveys.

Table 1 CPMS Review Summary

Respondent	What do you supply CPMS?	What do you receive from CPMS?	Future req. for CPMS	Business objects used outside of CPMS	Interface into CPMS	Tracking Mechanism
Local Projects	All proj info	Proj sched info	GIS/Spatial	Schedules from RUPUS		
Eng. Supp.	Letting date changes			Excel Sprd., Access DB	None	
Const.and Maint.	Status & date plans received	Proj activ. for time charges	Map of road w/proj	BAMS, CMS, Access DB		Proj #
Design	Prel estim of time & cost, Proj milestones	Proj data – sched/status	Remote wireless conn	BROMS, CANSYS, CICS, CMS, PONTIS	Time Sheet, Task data	
Transp. Plan.	None	Gen proj status	Assoc proj data with coordinates for mapping	CANSYS, KARS, Bridge DB, Rail Cross, Traffic data,	From bus object systems	
Fiscal Services	Obligation, expenditures, Percentages,	Billing reports		Fed Aid Excel Sprd.	From bus object systems	Proj #
FHWA	FHWA gives proj info to KDOT to enter into CPMS	Final vouchers from Fiscal	GIS viewing and LRS enabled	Excel Sprd. to track proj status	None	Proj #
Personnel		Estim. hours on proj	None	SHARP, CICS	CICS	Proj #
Traff. Safety	Work phases, funding split	Notice when proj is let, fund info reports	Ref beg/end of proj, Legal desc. of proj, Grant and multi proj tracking,	CANSYS, KANROAD	None	Proj #
Mat. & Res.	Jurisd proj, Track pub, Pool Funds, Cash Flow	Resp parties, Dates, Proj Info, Funding	Custom & Ad-hoc reports, DMS for reports	Excel Sprd	PMS via Oracle Gateway	Proj #

Respondent	What do you supply CPMS?	What do you receive from CPMS?	Future req. for CPMS	Business objects used outside of CPMS	Interface into CPMS	Tracking Mechanism
Supp. Services	None	Grant dollars, Funding info, Proj milestone		STARS, CCFB, IFIS, CMS	None	
Comp. Ser.		Report info	Wireless conf. room			
Traff Eng.	**Admin:** Hist. and forecasting **Signing:** Perm. signing **General:** lighting, pave. markings, signals	Hist. info, Proj. Man., Activity dates, Proj status, Charge time	Link to GIS, Accid. data	Excel Sprd. for funding	None	
ROW	Sched. Info	Workload info,	Link to GIS, 4000 Smart Maps tied to legal descr.	ROW Access Program	SAS	
Pub. Inv.	None	Proj sched., scope, loc., cost, length	GIS link to the PIP to show proj info, Tie proj together that cross county line	PIP, PID	PIP, PID	
Prog. Man.	Proj updates	All proj man. related info	CTP info, Proj level costs, GIS tie in, Map info from DB2	None	None	
Operations	Const. dates,	Contract info, Sched. Letting		CMS, General Ledger	None	Proj #
Man. & Budg.	Revenue and estimate info	Eng. cost, Util. reloc, ROW cost	Hist. tracking of proj	Excel Sprd. of cash flow	None	
IT Architect			Data WH, GIS tie in			Proj #

In addition, CPMS currently maintains begin and end logmile of each project. The elements are also in place to generate KDOT's standard LRS key. These critical pieces of information are what are needed to provide a location reference component to project data. In turn, decision support mapping can then be performed. This provides a spatial component to the data in CPMS.

1.2 GIS/Data Warehouse Project, August 2004

The Bureau of Computer Services (BCS) is currently gathering requirements for a GIS/Data Warehouse. This warehouse will function as an information database to support decision-making. The design of this warehouse will be structured for querying, analysis, and to maximize performance. This initiative is currently in the conceptual design phase. Requirements have been collected and a preliminary draft document has been written.

Preliminary plans are to populate the warehouse from operational databases. The update interval had not been defined at the time of the preliminary draft. This provides stable data in the warehouse. Business as usual can occur in the operational databases without the threat of corruption from an external source. The primary content of this warehouse will be business data from various operational units across the enterprise. The warehouse will also contain metadata pertaining to the data structure. The metadata will also describe the methods of data collection, and the accuracy of the data.

The warehouse will attempt to spatially enable the KDOT's current data model. The warehouse will be used with the base network produced by Bureau of Transportation Planning. Conceptually, data added to this warehouse will have a spatial component that allows it to be used with the LRM's used by the GIS Unit for the KDOT's base network. The dominant LRM is county-route-logmile. The route features that reside in the base network include an LRS key. The data in the warehouse will either already contain the LRS key or will have the necessary pieces to construct it. This will allow the data to be used for analysis and will overlay the base network.

Table 2 provides a table of the data classification and attributes to be built into the warehouse. This was derived from a larger table from the requirements document. The LRS key was not added to the list of attributes in the table because it is required of each data classification.

Table 2 Data Classification for GIS/Data warehouse

Data Classification	Attributes
AADT and Truck Traffic Counts for State System	AADT, Truck Counts, Traffic Count Year
AADT for State System	AADT, Traffic Count Year, Route Classification (I, U, K), Growth Factor, K Factor, Land Use (Rural/Urban), State Logmile, County Logmile
Statewide historical traffic counts	Traffic, Sequence ID, Location Description, County, City, Index Number (interchange), Route Classification (I, U, K), Leg, Raw Count, Adjusted Count
Statewide historical vehicle classification sites	Traffic, Sequence ID, Date, Vehicle Classification Count, Hour, Lane, Direction, Location, Location Description, Route Classification (I, U, K)
Traffic counts and other data from the ATRS Database	Location, # of Lanes, AADT, AADT Date, 30th Highest Hourly Volume, Peak Hour
Multiple attributes with offsets	Speed Limit, AADT, Access Control, Surface Type, Land Use, Shoulder Width, Shoulder Type
Accidents	Accident Key, RCRP, Accident Year, Deer Involvement, Speed, Alcohol Involvement, Total Fatalities, Work Zone
Bridges Data	Bridge Serial, Bridge Serial Number, Bridge Log Info, Culvert Info, Railroad Crossing Info, Reference Post Info
Surface Data	Surface Type, Surface Year, Surface Width
Accident Map by Roadway Type	Shoulder Width, Accident Key, Accident Year, County, Route Classification (I, U, K), Lane Class, Accident Severity, Construction Zone, Alcohol Involvement

There are several general requirements for the warehouse that will have an impact on the GE effort. Among those are:

1. Ability to view digital Orthophotography.
2. View files from KDOT's Document Management System.
3. Built on Oracle 9i (Utilize Oracle Spatial).
4. Use same linear referencing as is used by KDOT's base network.
5. Store the LRS key attributes.

1.3 Contract Management System (CMS)

1.4 Cansys2/EXOR Highways

EXOR Highways stores LRS related data in an Oracle relational database. The system is database-driven. It is a two-fold system that consists of network data and event/business data. The network uses a datum concept. The datum is a series of connected segments that provide the domain for transformations among linear referencing methods KDOT utilizes. The datum consists of segments that have attribute values associated with it. One of the attributes is a route identifier. This is crucial in grouping the segments together into routes. Each of the segments has a calculated length in meters. This is used by the grouping mechanism to generate different LRM's for a collection of network segments. There is a jurisdictional attribute (rse_agency) that equates to a county code that allows the segments to be grouped into jurisdictions.

Event data is registered to the datum segments as opposed to a route. This means each event is located as an offset distance in meters from the beginning of a segment. EXOR Highways has a process that allows the event registration function to occur. The benefit of locating an event as an offset distance from the beginning of a datum segment is when the network changes only the events on the effected segments have to be changed. This is a critical component in saving time in maintenance workflows for event data. If there is a datum level change a trigger is kicked off that time-stamps and retires the necessary records in event tables that have been registered to the impacted segments within the datum.

A series of views are created based on user requirements for access to data that references the network. The *road_segs* table functions as a datum component in building various types of LRM subsystems used for linear analysis and decision support mapping. These subsystems are known as groups to EXOR Highways.

Because EXOR Highways is proprietary, no published data dictionary is available. However, the primary structure of KDOT's implementation is as follows:

- The *road_segs* table contains a record for each road segment as well as each road grouping. Currently, the road segments are broken at intersections defined in the previous CANSYS system.
- The *road_seg_membs_all* table identifies the road segments within each road grouping. The primary columns in this table are *in_group_id,* and *of_segment_id.* Each road grouping is represented in this table by a set of records; in each record of the set, the *in_group_id* column contains the *road_segs* identifier of the road grouping, and the *of_segment_id* column contains the *road_segs* identifier if the individual segment.
- Asset (Event) tables contain the location of each asset item on the road network.

No additions or modifications may be made to the structure of the tables.

1.5 KGATE

1.6 TerraShare

1.7 Kansas Accident Records System (KARS)

1.8 KanRoad

1.9 Truck Routing Information System (TRIS)

1.10 Pavement Management Information System (PMIS)

1.11 Network Optimization System (NOS)

1.12 ATIS