

A Systems Approach to
Enterprise Application Integration
in
Waste Management
Collection & Routing

Author: Tony Graves

Agenda

- Problem Statement
- Historical Perspective
- Routing Challenge
- SE Approach to developing a Enterprise Application Integration

Problem Statement

- Waste generation is estimated at XXX tons/person/year.
- Waste is 'removed' via trucks and taken to local landfills.
- There are YYY landfills occupying ZZZ space across the _____ define a local area.
- Landfills reach full capacity at _____ tons or time.
- Population increases at a rate of _____, yielding the increase in waste disposal methods.

Historical Perspective

- Types of collection systems varied from public and private, to a merger of the two
 - Competing budgeting
 - Susceptible to Fraud and abuse
 - City of Pheonix
- Efficiencies in the collection process
- Collection System Administration

Types of Collection

- Public: New York City (DSNY)
- Private: Waste Management Inc. (WMI)
- Public + Private: City of Phoenix

One of the most visible services in a community.

City of Phoenix

- On the throes of a tax revolt in 1978.
- Public bids against Private sector
- City divides city into districts
- Contract Duration: 5 to 7 years
- Automation (Three person to one person routes)
- No layoff policy

Private Collection

- Responsibility rest with one or more haulers
- Franchise agreements for populations > 10,000
- Municipality enforces the licensing arrangement
- Competitive bidding process
- High cost do to lack of competition
- Contracts: Varies
- 7 years with 3 one year renewals
- Collection with Disposal (Castro Valley, CA)

Efficiencies

- Drivers redesign routes and work schedules
- Employees: Get 10% of savings generated up to a maximum of \$2000
- “Partnership Teams” (QA/QC)
- Accounting System: Cost Per house/Per month
- Monthly and quarterly awards given to the best drivers
- 1984: City goes to 32-cubic yard trucks to compete against private haulers by more than \$6 million!
- 1988: City controls all districts
- MSW cost go down 4.5% (inflation-adjusted dollars)

City Auditor: “Not public versus private, but monopoly versus competition.”

Collection System Administration

- - Records (audits, DMV, safety, labor, PM, fees, etc.)
- - Service levels (health, aesthetics, economics)
- -Productivity (service level, equipment, personnel)
- - Measurement: (No. of stops, weight, volume)
- Cost Factors: WMAC-CVSD Contract
- Contract Period: 2001-2009
- Steel (343%)
- Fuel (125%)
- Labor (35%)

- Rate Increases: 2009-2019
 - Residential: 45%
 - Commercial: 68%
 - Equipment: 72% used for collection
 - (+/-) 147k vehicles (Collection & Transfer)

Trouble in Dodge

- 1997: Arthur Andersen Accounting Scandal
- 1998: WMI
 - 1) Restatement of \$1.7 billion in earnings
 - 2) AA/WMI settle shareholder lawsuits (\$228M)
 - 3) AA fined \$7M by SEC
 - 4) WMI settlement and Enron scandal seal AA's fate
- Failures: Extended Depreciation (Materiality)
 - A) Trucks
 - B) Containers
 - C) Multiple Information/Accounting Systems

Pre-Route Restructuring

- Data Integration and Performance
- No Central Data Repository
 - A) Lapse in managing and serving key customers
 - B) Lack in Business Optimization
 - C) No cost-effective truck routing plan
- Key: Integrate hundreds of data sources into a single collective system.
- Provide a holistic view of customer data.

Routing at Waste Management Inc.

- Early Years: Acme Disposal, Milwaukee, WI
- Dean Buntrock and Stan Ruminiski created the ***Rolling Profit Center: 1960-1998***
- Guidelines: Labor, Fuel, Equipment, and Disposal
- Daily: profit margin of 30-35% “coming off the route” = decent profitability
 - To increase profit margin (“tuning the route”)
 - 1) Shorten travel distances
 - 2) Two-man to one-man trucks
 - 3) Container set out by consumers
 - 4) Eliminate valet service

Customer Buy-In

Customers stay loyal despite modest cost increases.

System Engineering Approach

Enterprise Application Integration

- The TAO of Turnaround
- The Routing Challenge
- Integrating Information Systems
- Quality Assurance/Quality Control
- Integration Competency Center (ICC)

1999: The Tao of Turnaround

- WMI hires Maury Myers and Tom Smith
- “If you can’t measure it, you can’t manage it.”
- Myers’ First Rule: ***“He who has the best information always wins.”***

Understanding The Business

- Both visit operating facilities and route men
- Smith: ***“The last place your going to learn how a business works is at corporate headquarters. Nothing beats working with a teamster on the dock. They’ll say, ‘You’re from corporate. Let me tell you what my problems are.’”***

The Routing Challenge

- Fixed Factors:
 - Climate: Sub-Tropical locations 2-3X/Wk
 - Topography: SF, hill terrain, greater route density
 - Container Access: Street or side yard collection
 - Transportation Systems: Truck, rail, water (Venice)
 - Types of Waste: rubbish, participles, C&D
 - Population Density: People per square mile

MSW: “Its local not global”

Integrating Information Systems

- Legacy AS/400's upgraded to enterprise-class AS/400's
- Network all local operating units
- Output of legacy application data reduction (from 8hrs to 3 min)
- Rollout of PeopleSoft enterprise wide System includes:
 - general ledger
 - asset management
 - accounts payable functionality

- **Quality Assurance/Quality Control**

- Targeted Customer Surveys
- Each customer has one billing number.

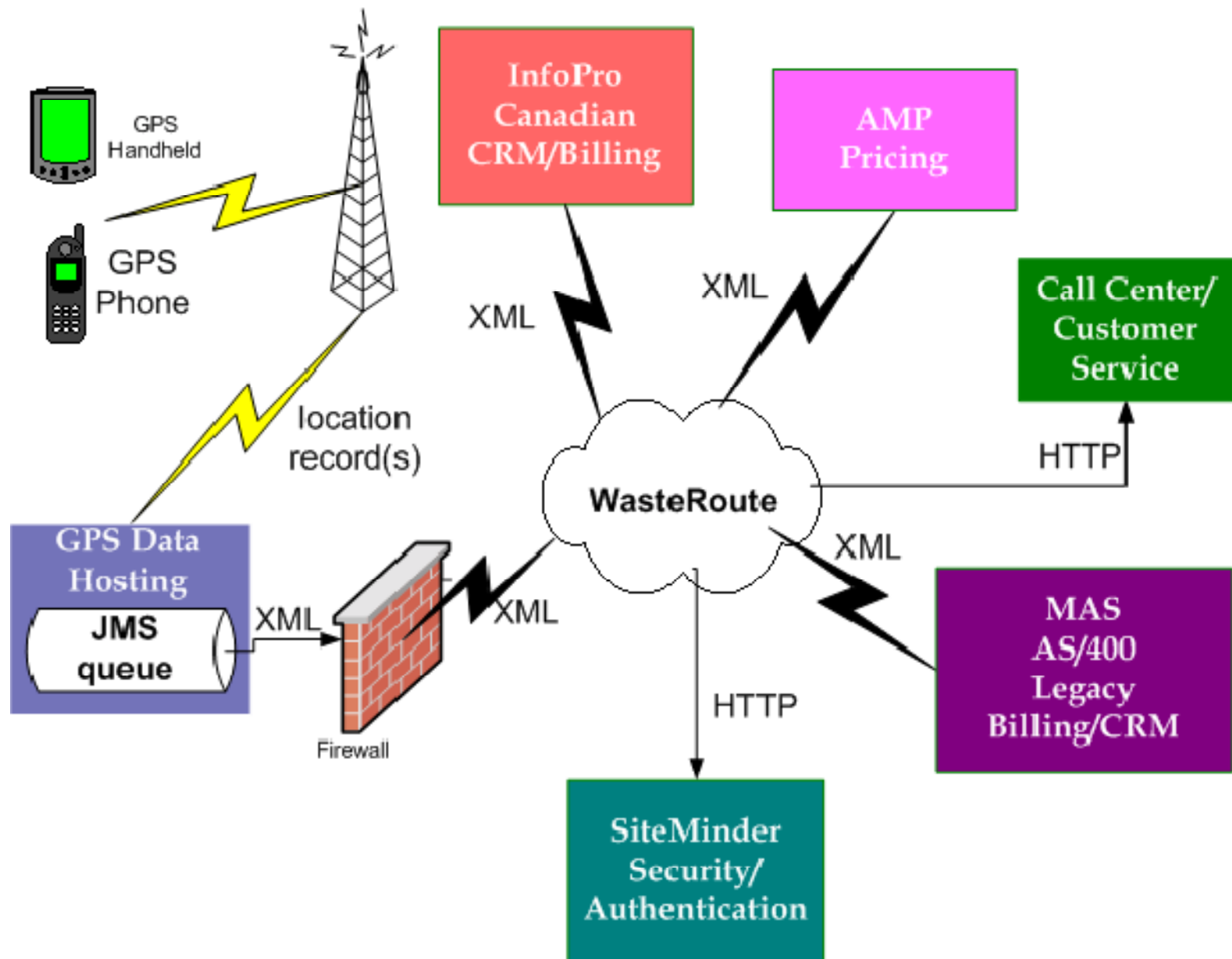
Service Machine Initiative

- Consistent approach to customer service
- Focus on new customer set-ups
- On-time service and customer handling
 - Look at profitability at all levels
 - Define Operational metrics
 - Use of granular profitability information
 - ERP
 - Route tracking, and maintenance software
 - All IT investments must show a 15% annual return

Integration Competency Center (ICC)

- Integration Objective: Customer holistic view.
- Competency: expertise, knowledge, or capabilities
- Center: Managed from a central point
- A) Shared Service Function (SSF) that consist of:
 - 1) Data Integration: Access fragmented info from enterprise data and functions.
 - 2) System Integration: Component sub-systems into one system and seeing that they work.
 - 3) Enterprise Application Integration: Info Exchanges / business process automation in a cohesive fashion

WasteRoute - Enterprise Application Integration



ICC Key Objectives

- Enterprise integration as a formal discipline
- Develop staff specialist in integration processes and operations and leverage their expertise company wide.
- Leverage the economies of scale for integration portfolio at the enterprise level.

Key Challenges to implementation:

- Organizational DNA
- Ability of the organization to deal with the pace of quantum change.
- Inappropriate funding

ICC System Hurdles

- **System Integration**
- Downstream applications
- Data from acquisitions of > 1,000 companies in the late 90's.
- Data spread across more than 800 separate libraries.
- Multiple IBM AS/400 servers (70)
- **Legacy Accounts Receivable Application**
- In use across the company
- Implementation of Mid-America Systems
- Extraction: Java coding methodology (JDBC)
- MAS: Flat file to Oracle table
- Load time: 5 days for 20M rows!
- **Data Integrity Issues**
- Lack of auditing and logging
- Few backward checks
- Backlog in project data requirements
- **Excesses**
- Personnel to maintain the system
- Frequent Timeouts

ICC System Automation

- Information Power Center loaded into an Operational data store (ODS)
- Goal: Load once - publish multiple times
- Extract Lotus notes and FoxPro
- Decrease in development times
- User-friendly design tools v. hand coding (Java)
- Maintenance: automatic propagation
- Improved performance markers
- Eliminated multiple Java processes
- Delta processing through In-memory hook-ups

ICC Efficiency Gains

- Resource optimization (Skills, resources, and processes into one group)
- Reduce delivery times and cost
- ROI through creation/reuse of enterprise assets (source definition, application interfaces, and codified business rules)
- Decrease duplication of effort
- Build on past successes
- Technology investments leveraged across the entire Enterprise.

Consolidated Customer View (CCV)

- Customer Service Representative (CSR) tool.
- Delivers customer/billing data in near real-time.
- Technology: Change Data Capture (CDC)
- Supplier: Informatica Power Center
- Rapid access to libraries and logical partitions
- Updates/reports ready in two minutes (AS/400) using Informatica Power Center,

Problem Solving #1

- Load-balancing methodology
- Extracts route data based on time zones
- Work flow: several sessions running on one time zone in parallel
- Time constraints/hardware limitations resurface to challenge the ICC implementation technology interfaces.

Problem Solving #2

- **Phase #1:**
- Use of Change-only data capture using AS/400 programming.
- Produces hardware stresses on the AS/400
- Primary key corruption caused by the had-coded initiative (Java).
- Limits up-to-date info to call centers.

- **Phase#2**
- Critical hardware upgrades:
 - IBM S85
 - Power Center Connect
 - Power Exchange
 - Oracle 9.2.0.3 (database, warehouse, & ODS)

ICC System Performance

- MAS batch process (6.9 MB/sec)
- Weekly batch process (9.7 MB/sec)
- Partitioning:
 - multi-threaded extract
 - Transformation
 - load processing
 - proper data routing
 - Insures data integrity
 - No more manual manipulations

IT Initial Success: e-procurement

- Total Customer Satisfaction process
- Select, manage, and reward suppliers
- Reduce supplier base
- Increased spending in MWBE
- End-user friendly
- B-grade supplier performance
- Suppliers tied to company goals
- WMI leverages size of spending & buying power

Example: Reduced truck body types from 60 to 14 (2001) To reduce purchase and maintenance costs

Measuring Suppliers

- Product & Technology Leadership
- Service & Support Leadership
- Quality, Delivery & Lead time Performance
- Total Cost Performance
 - All result area's include subcategories
 - Use of cross-functional teams (selection process)
 - Web-based tools for qualitative/quantitative performance

•The next level of system improvement:
Demand Management

Summary

1. An Integration Competency Center is operated from a single location.
2. Administration of metrics by a centralized team
3. Each application has its own service level agreements that must be met in order for critical business decisions to be made using the most accurate data in the timeliest manner.
4. Reporting requirements
 - a. Enterprise Integrated: summary reports/analysis path.
 - b. Enterprise Analytic: interday reports/Data cube tech.
 - c. Operational Reports: combined subject areas
 - d. Application Reports: transactions/summarization
5. Improved nightly/weekly batch processing
6. Near-real time processing
7. Branched out from warehousing to other integration initiatives using the same technology and infrastructure.
8. Capacity for growth
9. Rationalized architecture to support a single end-to-end process rather than enduring the cost and overhead associated with flat file staging.
10. Improved overall return-on-investment (ROI)