

CLOUDS – Cyber-Management of Staff and Students in Contra Costa County Preschools

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EXECUTIVE SUMMARY

This case study looks at the Child Location Observation and Utilization Data System (CLOUDS) as implemented by Contra Costa County. First implemented in 2009, CLOUDS replaced manual processes for monitoring and tracking classroom student and faculty activities for the 400 classroom staff and 2,500 students in the seventeen preschool day care centers operated by Contra Costa Children and Family Services. Each child wears a uniform vest with Radio Frequency Identification (RFID) tags sewn in the front and back. Staff also wear RFID tags similar to standard ID/Card Keys. RFID tags and sensors are provided by One Solution Technology, Inc., which leases the proprietary software rights and provides contracted technical support.

Each classroom is equipped with touch-activated computer terminals known as Wallpads,

which are linked to a central server where master databases are continuously updated in real-time. CLOUDS provides increased security by continuously monitoring the status of each classroom, including the location of each student, the delivery of appropriate meals and snacks, and the maintenance of proper staffing ratios. CLOUDS monitors the current and historic status of all children and classroom staff in the system, tracking such diverse data as attendance status, special needs, staffing, and meal service. CLOUDS uses this and other information to automate the processing of required state and federal reports. Contra Costa County program staff estimate that CLOUDS automation produces a \$120,000 per month savings in staff time alone while enhancing the safety and security of each child in the system.

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Introduction

Contra Costa County operates seventeen pre-school day care centers that are dispersed throughout the county. These schools serve over 2,500 children with a staff of over 400.

While the impetus to adopt the CLOUDS system was driven initially by a desire to enhance child safety, the real-time tracking, data mining and reporting capabilities have proven to be value-added enhancements to the pre-school system. Before the implementation of CLOUDS, managing the day-to-day operations, keeping track of staffing and attendance, and providing meals were labor-intensive processes requiring analog tracking and manual entry into a number of separate databases. Producing the mandatory reports required for state and federal programs was also a manual process that necessitated the physical posting of required data and manual submission to the appropriate entity. CLOUDS provides solutions by automating these processes and providing system-wide, real-time monitoring for each child and staff member in each classroom throughout the school day.

The CLOUDS process begins at enrollment, and automates the assessment, admissions, placement, and eligibility processes while monitoring wait-lists that might include as many as 5,000 prospective students. It provides classroom teachers and administrators with a number of tools for data management, including on-demand data mining, pre-set reports, and customized “SMART” reports on an *ad hoc* or continuing basis. The CLOUDS system provides teachers and administrators with tools for data and personnel management while enhancing the situational awareness of every classroom.

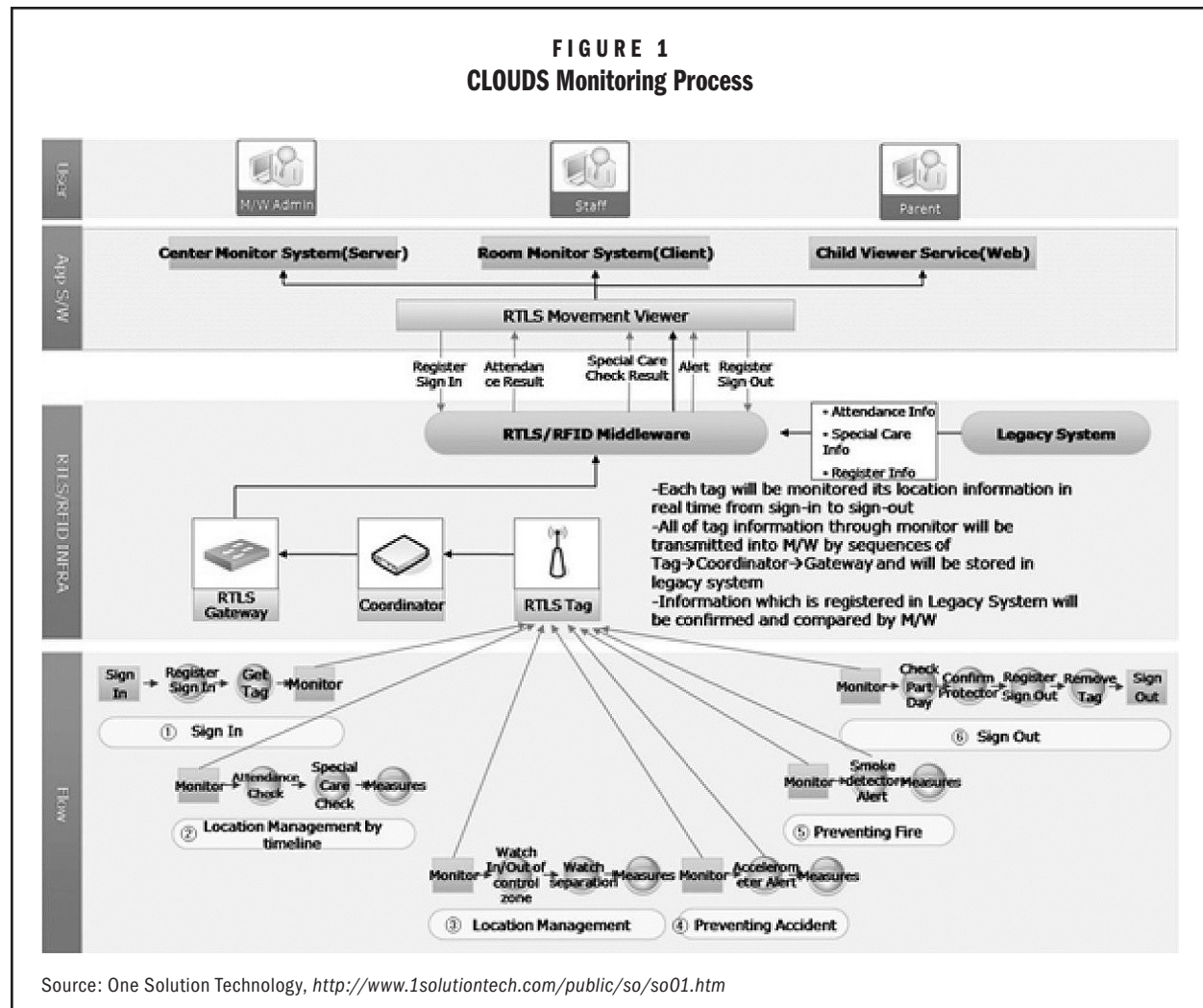
How it Works

The heart of CLOUDS is Radio Frequency Identification (RFID), a technology that saw its first uses during World War II. Its modern iteration, Ultra-High Frequency (UHF) RFID, is emerging as a premier technology for automating the identification and tracking of commodities, equipment, personnel, and other resources while collecting and maintaining data on their location, contents, and physical state. It is currently being employed in retail, defense, transportation, healthcare, and other industries, providing increased capabilities for asset and personnel management, logistics, quality control, and security.

RFID tags or transponders are small, film-like smart labels embedded with silicon chips that are read by Real Time Locator System (RTLS) sensors located throughout the facility. Much like electronic toll collection systems such as FastTrak[®] record toll crossings, RTLS sensors record the current status of every child and staff member in each classroom in each facility. Each child is registered into the central computerized system on intake. Then, when a parent brings a child to school, he or she signs the child in using a signature pad, which is very similar to devices used for credit card transactions in retail stores. This logs the child in and records the time of arrival.

Once signed in, the child puts on his or her uniform vest fitted with RFID tags in the front and back. The tags are coded with data specifically identifying that individual child as he or she moves in and out of classrooms and play areas. Staff is then able to access all information and record any data using computer screens located throughout the classroom, or by using a networked smartphone or tablet device.

FIGURE 1
CLOUDS Monitoring Process



From sign-in to sign-out, at which time the child removes the vest, students are continuously monitored both locally and in the master database. The CLOUDS system uses these data to generate automated current real-time or time/date-specific attendance and staffing reports for each classroom. *Figure 1* illustrates the process.

Let's follow this process through a typical day.

SIGN-IN

When a child is brought to school, the parent or guardian signs him or her in, and the child puts on a uniform vest with unique RFID transponders sewn in the front and back. The child's attendance is automatically recorded into the database, and the child's activities are tracked and recorded throughout the school day until the child is signed out by

the authorized parent or guardian, and physically removes the vest.

THE SCHOOL DAY:

REAL TIME LOCATING SYSTEM (RTLS)

The class roster is displayed on the Wallpad screen with the child's name and photo. Each child is tracked throughout the day. A color-coded background shows each child's status as present, absent, or in transit. Any children with special needs are monitored in a way that ensures they receive the appropriate specialized care in a timely manner. Should a child manage to leave his or her designated area and enter an area that is unsafe, such as a supply closet, CLOUDS generates an immediate alert and the child's location is shown on-screen, allowing staff to immediately locate and return them to their appropriate

class or play area without incident. RTLS sensors also function as smoke detectors, thereby providing an additional layer of safety in the classroom.

SAFETY

CLOUDS provides real-time monitoring of staff and children in both classroom and play areas, recording attendance, food service, and activities. CLOUDS provides a seemingly infinite number of charts, records and reports for each child, each class, and each facility. These reports may be organized by day, week, month, and year. Special forms can be created within CLOUDS to monitor such diverse data as parent involvement, cognitive development, social functioning, and classroom participation. Additionally, CLOUDS delivers customized “SMART” reports created by content experts. These reports display as a dashboard on the computer screen to provide visual displays that enhance and support the data, providing real-time status, location, and history. These visual records are reported to improve the work efficiency of the teachers and to serve as an invaluable aid in the tracking and delivery of differentiated services appropriate to each child.

Program managers can get instant status information on mandatory reports, displaying them as complete, due, or past due, and identifying the responsible staff members. A major labor-saving function is the virtually error-free automation of state and federal reporting processes. The automation of reports and protocols that was previously accomplished manually produces an estimated cost-savings of \$120,000 per month. Because classroom staff spend less time on paperwork, they have more time to spend with the children.

AUTOMATED MEAL COUNTS

CLOUDS receives and stores real-time data on exactly how many children are in attendance on each school day, and then generates the appropriate number of meal orders. Special dietary requirements are listed in the system so that all children are served nutritionally correct and culturally appropriate meals. CLOUDS automatically records the time at which each child is served a provided meal or snack.

CLOUDS has reduced food waste by ensuring that meals are prepared and provided only to children who are physically in attendance on a given day. Contra Costa County staff report that this feature alone has resulted in a 25% savings in overall food service costs.

SIGN-OUT

Every child's unique RFID tag contains the personal identifying information and photographic images of all parents or guardians who have authorization to pick them up at day's end. This allows staff members to verify the identity of each adult guardian before releasing the child, ensuring that all children are released only to an approved parent or guardian. Once the child is signed out and removes the vest, the daily process is complete.

STAFF TRACKING

Not only does CLOUDS record the status of all children in the system, but it also provides data on staff. All classroom staff wear a lanyard with a photo ID embedded with a RFID tag that links to their employee data, ensuring that each classroom is staffed with teachers, assistants and aides with the appropriate level of training and certification for the children in that classroom. The system notes when there is a short-staff situation in any classroom, and generates alerts so that administrators can then assign an appropriate substitute and maintain proper staff to student ratios. The system displays, in real-time, what staff are present, absent, or in transit while electronic sign-in and sign-out automatically populates staff time cards while the automated system tracks vacation, sick time, and other leaves of absence.

SECURITY AND PRIVACY

Because security and privacy are major concerns, confidential CLOUDS data are protected in a number of ways. There are multiple layers of access, each of which can only be reached by personnel with express authorization. These layers are limited by group, such as parent, teacher, administrator, and others. Clearance to access any file or group of files is granted on a need-to-know basis. Finally, the entire system is

protected by three-digit encryption technology, safeguarding personal and confidential data from compromise and intrusion.

Cost

The implementation of CLOUDS required a substantial initial investment for the hardware necessary to make it operational. These costs included the purchase of the touch activated Wallpads, signature pads, RFID tags and sensors, as well as dedicated servers and other infrastructure components. This initial hardware and infrastructure cost was approximately \$160,000. The CLOUDS software is proprietary, and is provided by subscription as part of the contract with One Solution Technology, Inc., which also includes technical support. The monthly subscription cost is approximately \$3,000 per month.

Potential Applications in San Mateo County

The most obvious use would be in the San Mateo Children's Receiving Home. While the initial cost of a CLOUDS-type system might be difficult to justify for the small population, the automation of the reporting processes could likely produce a cost-savings that would offset the initial expense and produce cost-savings over time. Since the system can be adapted to ensure the security of vulnerable clients in any controlled facility, there might also be applications in juvenile justice that warrant further study.

While CLOUDS is a child safety, locator, and data system, the RFID/RLIS infrastructure can be applied in many areas. RFID tags are monitored in real-time, thus enhancing the security of any persons, equipment, or other assets assigned to each tag. Hardware installed both inside and outside facilities transmits data received from RFID tags into a central monitoring system. This could be used to automate sign-out and the return of specialized equipment or other assets on a daily basis, or in an emergency situation. Optional movement and temperature sensors allow administrators and managers to observe and track situational changes while an emergency call feature can facilitate rapid response when emergencies occur.

Summary

The term "real-time" is used frequently throughout this document. While it may seem overused, I deem it to be essential in describing the nature of the CLOUDS program. The CLOUDS system enhances the safety and security of all children in the Contra Costa preschool day care centers by alerting staff immediately if a child should wander away from an authorized area, and improves the data integrity of the entire child-care system. No more wondering, as one runs a report, whether or not the data are current. No more time-consuming analog calls to facilities to get current classroom census, or to confirm that all classroom staff have reported for duty. Data are updated on entry, and the databases and reports are kept current in real-time through the automated process. Literally hundreds of datasets can be accessed with a few keystrokes. Any number of mandated and special reports can be completed, processed, and submitted by the CLOUDS system with staff *never* having to touch a paper form, and the data is always available and continuously updated in real-time.

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