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Agentic N-Way DataSyncs

This whitepaper discusses Agentic N-Way datasyncs, and how Echo Messaging Systems, using our ADIN AI Automation platform solves the difficult but widespread problem of freeing data to flow between systems in order to create more deeply functional IT systems. Data is the life blood of information technology systems and IT systems generate, manipulate and employ data as its core function. IT systems and data are foundational to almost every aspect of human life, from healthcare, financial, entertainment, safety, government, military and any other industry, public or private segment that you can think of.

All algorithms described in this whitepaper have been implemented and are incorporated into various client solutions. The technology, created by Echo Messaging Systems, Inc., is propietary and patent-pending.

Data, being the most important aspect of any IT system, can also be limited in its use outside the confines of the IT system. Data in IT systems have limited ability to migrate, affect and otherwise interface with data from other IT systems. Architectures that allow for common data sources, such as data lakes or data warehouses, set up IT systems where the data is not confined within one system, but as its own entity. However, like data that reside within IT systems, data access is limited and highly controlled. API's provide access but are often not fully documented and can have incomplete features.

Widespread problems in aging architectures running critical systems for commerce and other industries must migrate to newer supported hardware before components, such as old mainframe systems, break that cannot be repaired. The challenge is even greater because migration must happen without interruption of day-to-day operations. Our Agentic architecture, where agents run in containerized environments, allows duplicate systems to run side-by-side, sharing data while new hardware, software and human interfaces are tested and proven.

In our over two decades of providing Agentic AI Automation solutions in real world scenarios, companies who need to have data shared and/or migrated across multiple systems are a common problem. Echo's ADIN AI Automation platform is well suited to creating datasyncs and we have expanded our support for generalized Agent-based datasync support allowing for datasyncs beyond the simplest configuration of a one-way datasync, where data from System A flows into System B when data in System A is created or updated according to rules of the datasync.
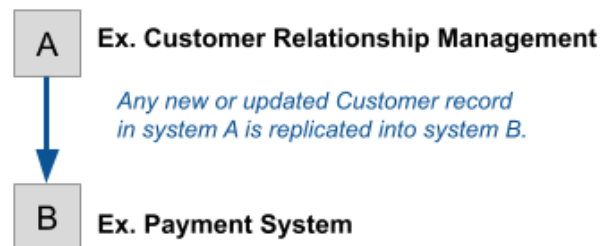

Figure 1. One-Way DataSync

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Figure 1 above shows a basic one-way datasync where a Customer Relationship Management system (A) that manages all Customer Account data needs to copy all new and updated account information to a separate Payment System (B). If there are no built-in features to transfer data between these two systems, or if one of the systems is based on older technology, then options to implement datasyncs are limited.

Our Agentic AI Automation platform, called ADIN, which stands for "Anomaly Detection and Intelligent Notification" has been in use since 2008 when the original 'Echo Messaging System', a multimodal communication tool needed to pivot during a suddenly bad economy. The Echo Messaging System's Delivery Engine was quickly refitting a generic Agent platform which could respond to a large number and variety of triggering criteria, such as time, location, and/or data values or any combination of these triggering factors. An ADIN agent can fire or 'activate', for example, at noon every day when there are customer records with status 'READY'.

ADIN Agents each have one or more action responses, such as, create a new record in an IT system, send an email notification to an admin, activate an IOT device, or clone an ADIN agent to run over high volumes of data, or any number of other actions.   ADIN Agents are flexible and re-configuration, which means their overall lifecycle is less taxing on developers and system architects, allowing for more time for key function development instead.

Agents

Because each ADIN Agent is composed of two sections: the "Triggering Criteria" and "Action Response", we assign an ADIN Agent to each ruleset and flow of data, as shown by the blue arrows below from one source datasource synced into the Center Hub, along with the set of arrows propagated out to the target datasource. These datasources, rules into and out of the central hub is called a Station. Many stations can run simultaneously operating over different classes and types of data.
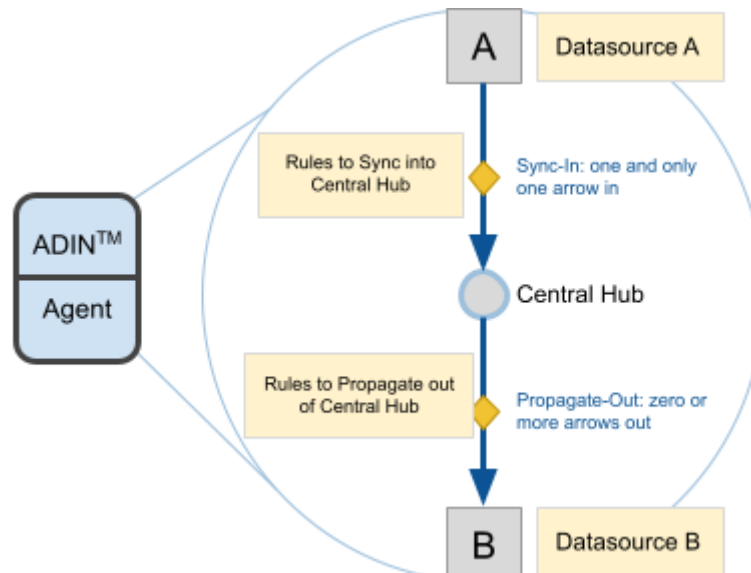

Figure 2. Parts of an Agentic AI Automation Station

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For example, one station syncs Customer Account data between datasources, another station syncs invoices, and a third station syncs payments. Stations define the flow of one object type from one datasource into any number of target or destination datasources according to a set of configurable rules as shown in Figure 2. We call the graphic representation a 'Hub and Spoke' architecture.

Station rules define the conditions and configurations that may vary either over time or from user to user. For example, a sync-in rule can determine if only new records are processed or new and updated records are processes.

Hub and Spoke

The Central Hub is key to our Agentic N-Way datasyncs working by providing a central place where data, keys, status, configurations, and more are stored and maintained. Web applications and client applications provide interfaces into the Central Hub that give insight into results and status, as well as a place to configure rule options. Interfaces are shown in a later section called "Interfaces - Web and Client Apps".

Even one-way datasyncs between two disparate systems can be a challenge. Our ADIN Agents have more than 20 years' experience in this area, so the mechanisms of detecting something new or if something important changed, how often to check, matching records between systems that represent that same account, running asynchronously, data gaps from webhook event processing and many other challenges that are common hurdles are already solved within the ADIN agent platform. Using a "Hub and Spoke" approach with ADIN agents assigned to each station, we can create sophisticated solutions where moving data, replicating records, syncing key items between systems can be built into large IT systems.

A one-way data sync allows companies to grow and scale their existing IT systems using various proven solutions and data sources without being forced into enterprise-wide solutions that provide umbrella-coverage to the enterprise but may not necessarily provide the depth or key features needed. Companies that grow are often forced to migrate to enterprise ERP systems in order to scale but then are dependent on costly custom buildouts to cover missing features. Options in the ERP system are limited and for smaller businesses cost prohibitive.

Migrating Old to New IT Systems

The challenge with updating new technology is how do you get the old data into the new system. If the new technology doesn't provide tech support or import features, this can be a challenge. Often, it is best practice to run old and new systems concurrently to ease transition challenges, such as detecting missing requirements in the new system, or comparing results from the new technology against the old technology to verify requirements are met.

By employing a two-way datasync as shown in Figure 3, data collected in the old system A will replicate into the new system B. As features are tested in B, data is replicated back into A allowing for an overlapping usage. Initial testing will require that A is backed up and restored into a sandbox environment. System B is setup as initially blank.

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Running just the one-way datasync initially and setting rules out of A based on a new data from the Central Hub's point-of-view going back to a launch date will seed system B with replicated data from A's sandbox system. Next, turning on the second datasync so that new data from system B will replicate into A. Testing data integrity according to a predetermined test plan can be run over both data sources. Discrepancies and errors will allow for a correction to System B, and a full restart of the sandbox environment. Once the sandbox passes the test plan, this process can be done one more time, but the sandbox becomes the new production environment, where both the current and system new systems will run concurrently if desired.
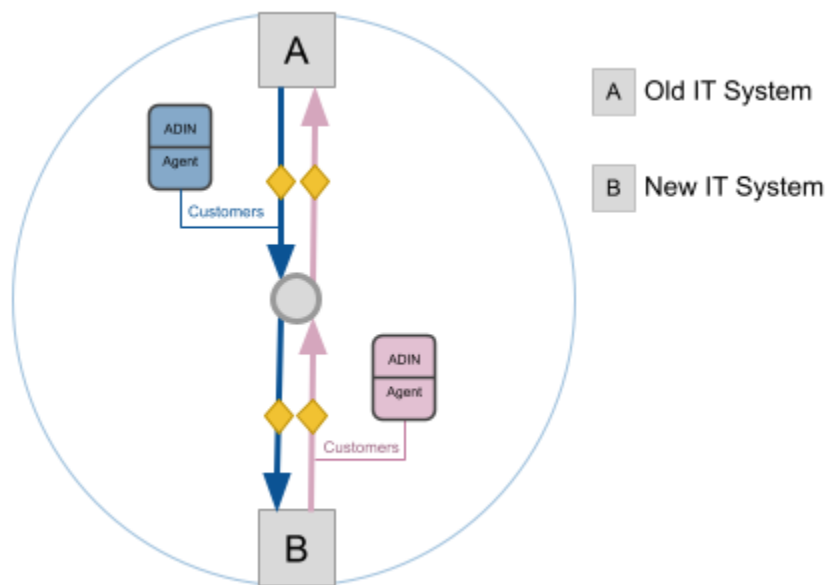
Figure 3. Two-Way DataSync, two ADIN Agents

Older architectures on mainframes that used older languages like COBOL and Fortran are at risk of causing harm to companies through the disruption of IT services as these older technologies become harder and harder to maintain. We help our customers migrate to new systems migrating the old data by using containerized Agents.

Containers such as Docker allow each ADIN agent to run independently and asynchronously from all other agents. Agents can connect to the same datasources. For migration tasks, ADIN agents first extract and relocate the old legacy data out of the confines of the old IT system. Our agents work with all API's but for older systems, connect directly to databases and work with the lowest common access points such as flat files, directories of data, and with information on proprietary systems extra directly from binary data sources. Once mapping rules are established, any number of agents running in their own containers can chip away at the job of migrating legacy data into a more modern data environment, such as relation databases, data warehouse and data lakes. API into the target datasource will be used to complete the old to new data mapping tasks.

Once the process of extracting and migrating data is established, with containerized ADIN agents, the process can be replicated over and over, as new systems and architectures are developed and tested. New systems that work on migrated data can be testing as many times as needed, replicated to

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as many data locations as needed. Once the new system requirements are met and final migration of data from the old system to new will give the new system a full history of the legacy data. The new system can run concurrently to the old for a period of that that architects feel is necessary for meeting all testing milestones.

Multi-Way DataSync

Our "Hub and Spoke" architecture for agent-based datasyncs means that more complex data streams can be configured between any number of systems.
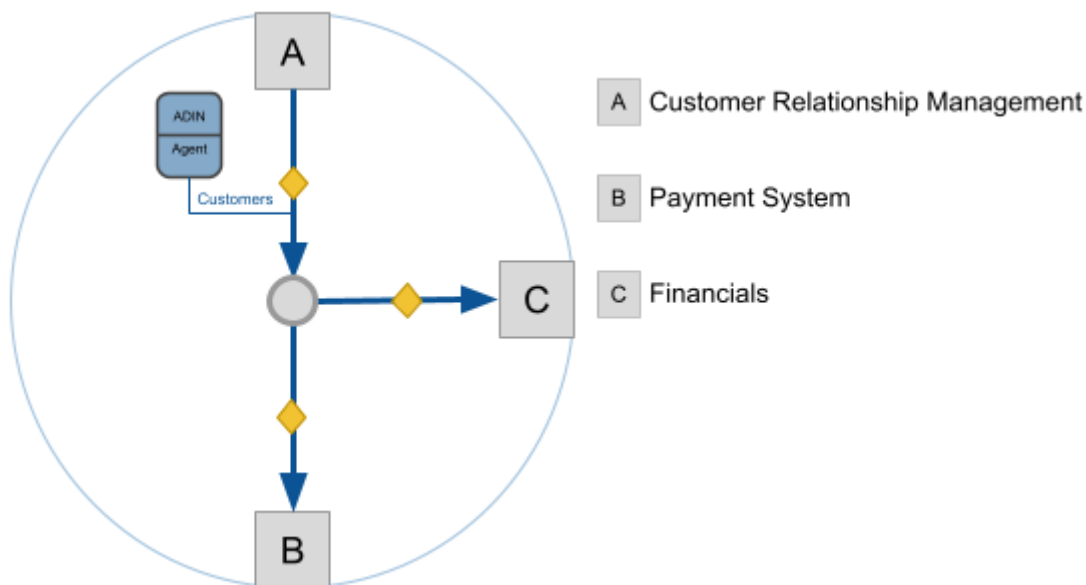
Figure 4. Multi-Way DataSync

In the example shown above, Figure 4 shows an ADIN agent is configured to sync new and updated Customers from a Customer Relationship Management system into two other systems, one a Payment System and the other the company's Financial system. All customer information is updated in one place in the CRM and further updates to the other two systems are done automatically. Triggering ADIN agents into activation can be done a number of ways. Using the DataSyncHub web application (shown in a later section), Stations (and their associated ADIN agents) can be run on a timer, on a preset schedule or on demand. Timer-based processing means that every "X" minutes on an interval, where "X" can be set in the user interface, the source IT system is checked for new and updated data. Frequent checking means that data quickly syncs between systems.

Webhooks, if available by the source IT system, can be employed to handle events as they occur, caching them into the central hub for processing on the timer, schedule or on-demand. ADIN Agents are not limited to only these three processing types. The 'Triggering Criteria' section of all agents can be activated by time (timer, schedule) or by data (a button press) or any combination of triggers involving data, time and space.

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Complex Application using Agentic Multi-way DataSync Stations

Building on the idea that multiple agents can run simultaneously, with syncing different types of data among two or more IT systems, we can architect complex solutions such as the following example based on an actual client solution. The main system is (A) Customer Relationship Management system. This is where employees use and maintain customer information, including orders and if account payments are up to date.
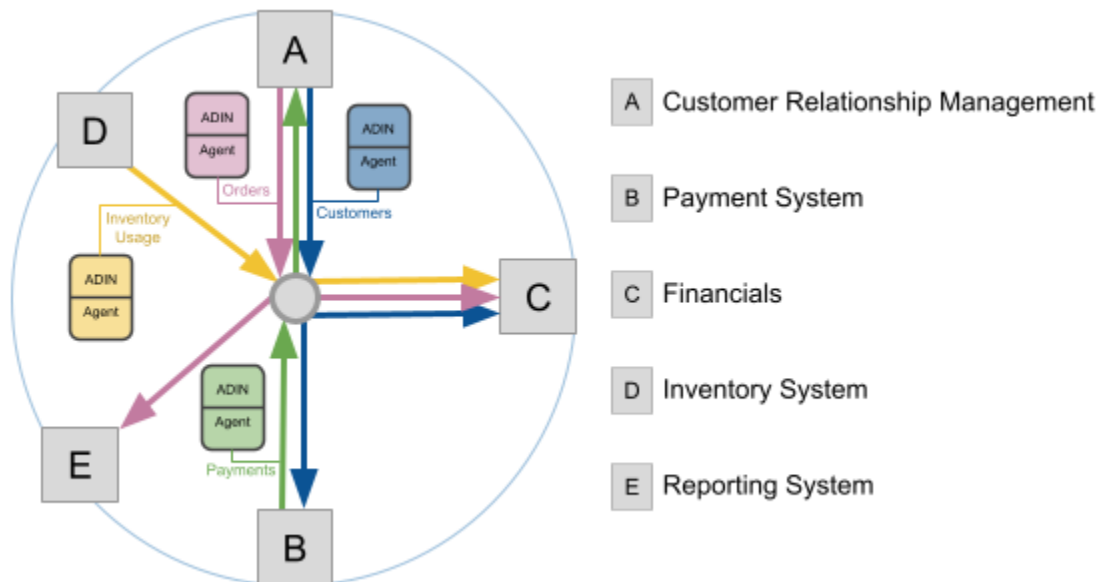
Figure 5. Stations are color-coded and data of each type is processed by one ADIN Agent

Access to the (B) Payment and (C) Financial systems are restricted within the enterprise for best practices, so customer data in sync the CRM into the Payment system for automated payment processing and into the Financial system for accountants to perform all bookkeeping tasks. An inventory system (D) is used by the warehouse to track items received from vendors to make orders. And finally, a (E) Reporting system gathers information for forecasting and advanced AI analytics, which aren't offered within the Financial system, but serves as a key tool by the corporate team for deep insight into the health of their business.

Without asynchronous, autonomous agent-based processing of N-Way datasyncs, our client's administrative team would spend hundreds of person-hours replicating data or making use of inadequate tools in the CRM or going without key insights into their business. Once Agentic N-Way datasyncs are set up, audit logs are produced for all syncing activity, and exception reporting shows where data may need human intervention. Additionally, Notification ADIN agents can be added to datasync systems for automated alert-based notifications in real-time.

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Interfaces - Web and Client Apps

The Central Hub is where coordination of the various ADIN Agents happens and where users can, at any time, see results. The Results Audit Log interface includes color coding, which is tied to user interactions, shown in Figures 6.
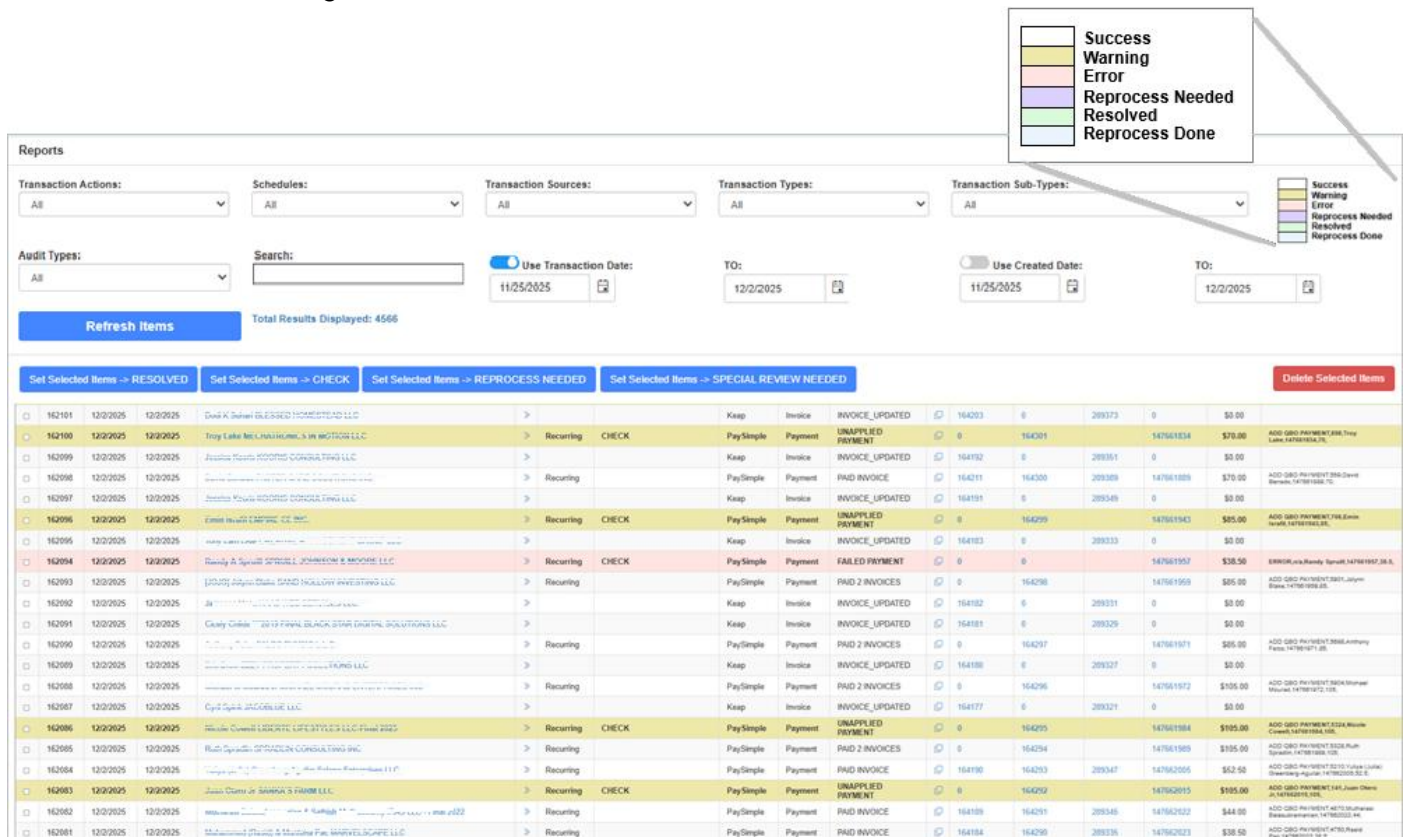
Figure 6. DataSyncHub Web Application – Audit Results

Users can filter results based on errors or warnings, the source of the data (CRM, Payment, Financial), by type of data being synced (customers, invoices, payments), the subtype if an error or warning occurred, date range for both when the result log was created and when the transaction took place.

Result status can be updated from 'Check' to 'Resolved' by the user, or from any status to 'Resolved' or 'Needs Special Review'. These records become color-coded for administrators to handle any special cases or issues that need resolving within individual IT systems.

Once an issue is resolved, users can set records to 'Needs Reprocessing'. Customers, invoices, payments and any other datatypes that are synced, will be reprocessed the next time agent processing occurs. Once reprocessing is completed, the record status is updated to 'Reprocessing Done'.

The various stations are controlled within the DataSyncHub web application as shown in Figure 7. Each station has setting from the source into the Central Hub and from the Central Hub out to the targets. Each can be individually turned on/off. Also, for this implementation, objects being sync can be limited to

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new records order or new and updated records. For each station, a process type is set of TIMER, SCHEDULE or ON-DEMAND. These can be set at any time. Once configured and testing is done, setting stations to run on a TIMER is the simplest. For the example, payments are synced according to a specific date. This is to allow the Financial system control over what days are synced in. So, once per day, the date is updated to 'today', then press the 'Sync On-Demand one time' (Figure 10).

Figure 7 DataSyncHub Web Application – Configure ADIN Agents rules and processing type.

Figure 8. Timer Processing Type Options

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Figure 9. On-Schedule Processing Type Options

Figure 10. Sync Processing Options