

Wyoming Enterprise Extendable Code Library

Enterprise IT Management Initiatives

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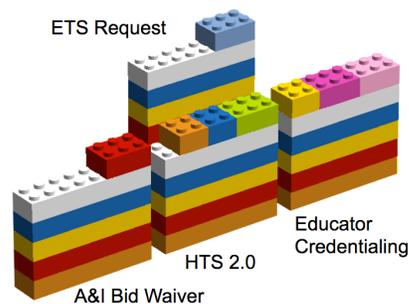
State of Wyoming's Enterprise Extendable Code Library

Executive Summary

Governments are similar in what they face, who they serve and how they do it, yet it is common for 50 states to do same thing 50 different ways. Many of the applications built are solving business problems not unique to their field and often times not unique to other agencies in their state. The core features they are trying to solve for are extremely similar, if not synonymous.

The State of Wyoming's Department of Enterprise Technology Services (ETS) has worked hard to create redundant and reusable code modules, which assist in new development for state agencies solving for common problems across the enterprise. This componentized library is commonly referred to as 'lego blocks'. Each block serves a specific function; for example, login, security, reporting, workflow, etc. Future application development efforts are architected with ETS' core blocks, then combined with the necessary code to quickly meet agency needs for less cost and less time than traditionally produced software.

Agencies no longer need to navigate the procurement process requesting significant funds to build solutions. With the reuse of code and standardization, ETS has created a new synergy previously absent from many state government projects. Instead, future enhancements are shared with multiple agencies with little effort in the form of a rebuild/redeploy of the application. Such synergy is evident in the "Notification Lego" which was originally designed for email. With this block, ETS is not just trying to build notifications, but building notifications based upon very common features. In the future, an agency leveraging the Notification Lego may have a driving business need to use SMS or another type of notification. That agency would budget for the necessary functionality in their application and the other agencies using the same block would be eligible to receive the new notification methods to their applications as well. The cost and time savings is exponential. Each improvement raises the capabilities of all applications using the lego code.



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Concept

States are traditionally fragmented in software design and the cost to implement new solutions is expensive, which often prohibits innovation. From the process an agency must go through to request funding, to developing in a silo away from other agencies often with similar business needs, creates unneeded redundancy and cost.

Stepping back and surveying that environment allowed ETS to rewrite the vision of enterprise application development in Wyoming and introduce a new roadmap for future projects. With many applications requiring a similar core functionality, ETS' new approach with the core lego code quickly solved for a significant portion of common application needs such as logging in, a consistent/standard user interface, uploading documents, printing and accessing data. The template for a well designed, secure and successful foundation is made readily available. The next agency needing a similar project can quickly meet their base requirements, then design their necessary functionality to meet their individual business need.

The lego blocks provide Wyoming the reuse of source code, compiled libraries, APIs and tools which have inherent functionality that can be modularized, utilized and extended within different solutions that have differing requirements and output.

The cost to develop code with a focus on reusability is higher than traditionally produced code, but worth it in the long run. ETS is able to separate the perceived from reality and solve for tomorrow. Agencies are now able to take advantage of their own instance of each or build out new applications without starting over. Their investments on new features will then become options of other agencies using the same code.

Java with Sencha GXT was chosen for the development language to provide a robust and proven base. Java is the most commonly taught programming language at school. It is also a win for Wyoming as a developer only needs to be proficient in one language. Many states try to avoid internal development because developers are expensive and hard to find. Designing in Java provides the ability for a developer to focus on one language that will be supported by the industry for many years to come.

Google App Engine (GAE) was selected for the NoOps cloud platform. NoOps is a new term allowing a business to not have to worry about their operations. GAE is hosted on Google's infrastructure, which is one of the most advanced of its kind. It becomes a hands off approach to the traditional Information Technology (IT) environment of today. ETS focuses on code and moving quickly with change, but is not concerned with the version of a server or the amount of RAM in the system to scale. GAE also works well with Java. The development team is able to quickly meet demand and stay current using agile methodologies where user stories drive the enhancement of an ever changing product. Tools such as Maven are also used to quickly prototype new apps and projects. Maven uses archetypes, which provide a faster development model to recreate past projects with ease, quickly combining the core legos into a new working app. As applications scale the model, building out new features on familiar code, it becomes faster and faster with each iteration and each sprint using both Scrum and Kanban to complete the most desired user stories as development progresses. Scrum splits developers into a self-organizing team, dividing



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work into small deliverables that are sorted by priority so work is accomplished in fixed-length iterations called sprints. This method allows the team to focus on the next needed priority and to be able to shift the project if internal or external factors dictate. Using Kanban for the Help Ticket System (HTS) 2.0 application, the work is split into smaller tasks and the development team works on a set number of tasks at a time until all are complete.

ETS selected BitBucket Git as the scalable enterprise code repository to allow multiple developers access to the unlimited repository storing lego blocks. ETS choose a cloud option so there are no servers to maintain on premise. Internal developers have access to quickly improve the existing lego blocks as well as create new ones.

ETS Business Analysts (BA) collaborate with agencies providing support on short and long term IT projects. BAs are a synced team with a shared frame of knowledge discussing each agency's projects to encourage them not to solve problems in a silo. If agencies are looking for a ticketing, purchasing or credentialing/licensing system, ETS can quickly spin up a copy of the apps available today. The BAs also promote the use of agencies reusing the lego code for new development efforts making agencies aware of the cost savings and the added benefit when another agency furthers the capabilities of an existing lego in use.

The State of Wyoming sees the enterprise code library as a significant and worthwhile investment. It elevates all software projects and provides a better return on the overall investment in code when it can be reused. The initiative is managed by ETS and adoption of the shared code is encouraged to all agencies through the legislature's initial funding.

Significance

Not all agencies have the same appetite for innovation; some have the desire to innovate and the funding to do so, while other agencies who do not, still end up with a safe, market ready, establishment approved innovative solution when using the shared blocks. Everyone receives the cost savings and innovative features that would not be possible if each agency were solving their own solutions in a silo. Visualize a new residential neighborhood of 100 houses built with a similar construction pattern by the same team of contractors. After completion, one owner decides they'd like an inground swimming pool so they work with the developer for their specific need. Once completed, the new core feature could be offered at no cost to the other 99 homeowners. Some may have been considering a pool, but they were not willing to secure funding initially. No need to worry as that is now a feature available to them with no additional effort. The entire initiative provides a benefit of economy of scale with more agencies using the code. Each application is created to meet a driving need of a specific agency using the same building blocks. As everyone's use of legos may differ, the state benefits with a wider group of test cases and it becomes far more robust and bulletproof than it would have been if it remained in one application, at one agency, solving a single problem.



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Benefits of the Extendable Enterprise Code Library include:

- Built on a cloud based, enterprise system.
- Improves standardization in IT development approach including standardization of conventions and coding practices.
- Promotes security through the reuse of proven tested code.
- Reduces complexity in development and integration.
- Increases in functionality as a single lego can be used to increase the functionality of all associated applications at minimal cost.
- Shared cost of maintenance; fixes and updates can be applied to multiple projects.
- Reduced the need for training and expertise in technical resources; greater opportunity for and lesser cost of integration between applications.
- Dramatic increase in buying power.
- Makes development of lifecycle environments (Development, Test, Stage, Production) more manageable and understood.
- Not stopping at the state level, the lego blocks are open source under the GPL for future developers anywhere to enhance.

Impact

The new model provides a means of exponential change for agencies using the shared code by providing enrichments not budgeted, but will still receive the benefit when another agency desires a new feature. Previously agencies were on their own to enhance a product and many times have gone without those new features. In this new paradigm, they are all able to grow with exponentially less effort.

If you only started off building the first two floors of a 30-floor skyscraper, any shortcuts, mistakes or less than optimal decisions will be a significant impact when getting to the 29th and 30th floors. Now we're dealing with multiple floors of weight, etc. If you aren't careful with how you craft them, the blocks don't snap together well and they will not work. This system was designed well from the beginning. The developers were aware of the impact changes would be down the road, as it is always easier to build it right the first time than it is to make a modification after the fact.



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Google Cloud Storage

Component that encapsulates functionality to store and retrieve documents to Google Cloud Storage.

Upload Manager

Component that manages generic uploading of documents. Includes both utility methods and a user interface to handle document uploading. This can utilize the Google Cloud Storage feature or plug in a different storage mechanism component.

Download Manager

Component that manages generic downloading of documents. Includes both utility methods and a user interface to handle document downloading. This can utilize the Google Cloud Storage feature or plug in a different storage mechanism component.

Document Organizer

UI component and utility methods to handle display and manipulation features to manage documents associated with data objects in the system.

Breaking down the 'Documents' Lego:

Its list of capabilities shows it has the ability to work with Google Cloud Storage. In the future, it may be necessary to support Office 365 as well. The agency requesting the new capability would finance that enhancement, so other applications using the Documents Lego would then be able to benefit from that enhancement and offer those new upload options to the end users with no additional cost of development.

One of the unexpected benefits of this project is the degree to which the agencies begin to cooperate, designing the roadmap and features set to build a single community instead of a fragmented one. Many of these applications have common features and many of them are trying to solve the same problem.

The cost of an agency requesting a new application whose business flow is close to the existing offering will be at a price no vendor could match. If they are solving for a training, ticketing or fiscal review process business need, the legos may meet 70, 80 or even 90% of the requirements. If they are able to make their business practice match the flow of an existing application, their development costs could potentially go from hundreds of thousands of dollars to potentially under a thousand. Spin up a new instance on Google App Engine, rebrand the application and the agency can be ready to add data.

One of our most successful lego applications was a Bid Waiver solution replacing a paper process with a fully automated application to ensure agencies who seek approval to enter into a purchasing agreement without competitive bidding on any contract over \$7,500. The agency reported that the new Bid Waiver solution has improved upon a paper process that used to take up to two weeks for approval and is now down to two or less days. The director stated "The previous process relied



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upon a submission sent by mail or e-mail. The procurement staff received and reviewed the submissions, sending the request back to the agency if additional information was required or if the submission contained errors. Procurement staff transferred the information to an internal, paper form and sent the request to the Governor's designee through the mail system. The bid waiver system has eliminated those steps that delayed requests and approval with an improved staff efficiency of over 50%. State government has improved considerably due to the transparency, timeliness and efficiencies of the new system.”

Highlighting once again the power of shared solutions, all agencies can now benefit from the core lego enhancements in this application as will current agencies when new core features are made available to them. The State of Wyoming's Enterprise Extendable Code Library will continue to be successful, innovative and elevate all agencies using the shared code for many years to come.

