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Executive Summary

In conjunction with an ongoing effort by the Department of Housing and Urban Development's (HUD) Office of the Chief Information Officer (OCIO) to implement a Department-wide enterprise architecture, Single Family Housing (SFH) has developed a proposed high-level target information technology (IT) architecture. SFH was deemed high priority based on the high maintenance costs of its IT systems and the overall inability of these systems to support the field operations and emerging business requirements. An interdisciplinary work group comprising staff from the Office of Single Family Housing, Office of Systems and Technology, and the OCIO developed the proposed SFH target architecture collaboratively¹.

Implementation of the SFH Target Architecture will significantly reduce the number of systems directly supporting Single Family's daily business activity. There are currently 30 official and no less than 6 unofficial (unsupported) systems. The Target Architecture establishes 7 core modules². The core modules may require as few as a single system each. This may result in up to an eighty percent reduction in the number of SFH business systems. This projection is based on analyses of the "as-is" baseline system environment that identified numerous systems that support common business functions and share similar data. Business functions and processes for SFH were then reorganized according to similarity in functionality and data use. The SFH target architecture minimizes functional overlap, improves data quality, and increases flexibility. It also identifies opportunities to leverage systems that cut across SFH and/or the entire Department. The SFH target architecture accommodates both the present and future requirements identified by Single Family Housing in its target architecture document.

The target architecture accommodates both headquarters and the Homeownership Centers (HOC) by integrating current ad hoc systems, such as the Underwriting Reports System, Quality Control Endorsement Database, and Nonprofit Approval Tracking System, into the appropriate business module. The target architecture parallels Single Family Housing's organizational divisions, in headquarters and in the HOCs, and will minimize system disruption across SFH as new development efforts are initiated. Additionally, the target architecture will reduce the total cost of ownership by modernizing the technology base and decreasing maintenance costs.

² These 30 systems comprise the day-to-day operations for Single Family Housing. Excluded from this count, but neither excluded from planning nor analysis, are the interrelated financial systems.

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 $^{^{1}}$ Appendix A details the process for building the target architecture.

On the basis of the level of effort that will be required to reach the target architecture, it is recommended that a SFH Transitional Program Management team be established within SFH to manage and provide direction as SFH transitions to the IT target. Process flow analysis and system development (e.g., business process improvement (BPI)) should be conducted in the functional areas of lender oversight and asset management. Following this work, a rapid systems development methodology should be employed to ensure benefits are realized as quickly as possible.

Introduction

Among other provisions, the Clinger-Cohen Act that Congress passed in 1996 gave the Department of Housing and Urban Development's (HUD) Chief Information Officer the responsibility for developing an integrated enterprise architecture (EA). HUD's Enterprise Architecture Team was charged with identifying strategic business objectives and aligning those objectives with the appropriate information needs and IT solutions.

In October 2001, the United States General Accounting Office (GAO) issued a report entitled "Single-Family Housing: Current Information Systems Do Not Fully Support the Business Processes at HUD's Homeownership Centers."³ In this report, GAO cited a number of issues with Single Family Housing's (SFH) information systems and called on the Department to delay SFH systems acquisition and development until a target architecture was defined. The target architecture would ensure that new development efforts were properly aligned with the core business functions carried out by Single Family Housing.

In addition to the findings in the GAO report, SFH realized that a critical review of all IT systems was necessary to address the current problems and a general lack of flexibility to meet future requirements. Another important driver is the ongoing effort by the Office of the Chief Information Officer (OCIO) to develop a Departmental Enterprise Architecture.

Single Family Housing as Part of the HUD EA Effort

At a very high level, one of the responsibilities of the EA Team is to provide a framework for categorizing the various aspects of the Department's daily activities. Specifically, the EA Team developed a series of reference models to guide the process and products (such as baseline and target architectures) produced as a part of the process. For the business layer of the architecture, the Business Reference Model (BRM) was developed. This model separates the Department's activities into six high-level business areas that decompose into 17 business functions. These business functions are further broken down into business processes and activities where necessary. The value of the BRM is that it allows for analysis and comparison of the activities carried out by SFH in a context that is similar to other offices within HUD. This information allows the EA Team to identify redundant processes and those that might be better served by leveraging a technical solution across the entire Department. It also provides a

³The full text of the report is available at <u>http://www.gao.gov/new.items/d0244.pdf</u>

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framework to compare processes with similar names or appearance and determine whether they are truly redundant.

The EA Team used two other reference models: the Application Reference Model (ARM), which identifies core and cross-cutting capabilities to find system redundancies and areas where additional automation can be implemented; and the Technical Reference Model (TRM), which is used to classify standards and products into high-level categories to allow for better coordination of acquisition and support. Each reference model played a part in developing the target architecture for SFH.

The EA Team operates according to an established set of principles that help to shape the development of the EA and the implementation of information technologies.⁴ Among these principles, the following have had the most impact on the process.

- **Core Business Operations**. Development of the SFH target architecture began with identification of the core business operations of the office. The EA Team was then able to focus on operations that must be supported by SFH systems versus those that could be supported either by systems in other areas of the Department or by enterprise wide solutions.
- Enterprise Solution. During this project, the EA Team sought ways to leverage technical solutions across the entire Department where appropriate. The core business of SFH dictates that this office performs certain processes. On the other hand, there are certain processes that SFH should not consider as part of its core business.
- **Reduce Complexity.** SFH uses approximately 36 systems and data bases to support its current operations. An examination of these systems and databases found that a considerable amount of overlap exists, with minimal flexibility to meet emerging requirements. One goal was to eliminate redundancy where possible and reduce the overall complexity of the systems.

The Vision for Single Family Housing

This document is not an implementation plan for consolidating or replacing current SFH systems. Instead, this document is intended to set a direction for investing in information technology. That new direction will show how

⁴ HUD's EA Principles are available at <u>http://www.hud.gov/offices/cio/ea/eaprin.pdf</u>

SFH operations can be improved through a streamlined system architecture for Single Family Housing's business lines.

An implementation plan will be developed that includes an analysis of the activities being performed in each system and an assessment of how each computer system meets the goals of the target architecture. The order of implementation and the integration of systems will be influenced by the following factors:

- The priority assigned by the Office of Single Family Housing to the present and future activities detailed in the Single Family Enterprise Architecture
- The age and functionality of the existing Single Family Housing systems
- The existence of common data elements and data usage
- The current costs of maintaining and operating these systems
- The cost of developing new systems and for operating new and old systems in parallel for a period of time
- The availability of commercial software that meets Single Family Housing's present and future activities without having to develop customized software
- HUD's IT investment decisions and the amount of funds approved for changes in Single Family Housing systems

When the priority, cost, and type of systems have been determined and approval has been obtained to make these investments, an implementation plan will be developed to guide system modernization for the next 5 to 10 years.

Strategic Goals for the Single Family Housing Architectural Vision

On the basis of its analysis of the SFH baseline architecture and the concerns expressed by users, the EA Team concluded that system capability can be substantially improved by using a common software platform, replacing systems that are past their design life or that do not provide needed functionality, and consolidating the large number of separate systems into a more manageable group of related systems. The following goals have been established to ensure that the SFH environment continues to evolve toward the realization of these improvements.

- 1. *Improving Systems Adaptability*. Developing systems that are more adaptable to changing business needs, and that allow for innovation and changes in program delivery without excessive downtime or reprogramming costs
- 2. *Improving Systems Usability and Reliability*. Ensuring that system data is consistent, reliable, and accessible to employees and partners.
- 3. Reducing the Total Cost of Ownership for Single Family Systems. Ensuring that Single Family Housing systems costs are controlled, that SFH management is advised of cost saving opportunities and given choices in technology selection
- 4. *Improving Systems Security*. Ensuring that business information is properly protected in accord with security levels that are proportional to the harm that may result from loss, unauthorized access, or modification of that information
- 5. *Simplifying Systems Administration.* Rationalizing the existing inventory of Single Family Housing systems to consolidate similar functions so that duplication is eliminated.

A Functional View of The Existing Single Family Systems

The Single Family Housing insurance business lines are complex due to the large number of insurance products offered, nonstandard servicing operations (subsidy payments, HECMs, assigned notes), and a high level of scrutiny. SFH activities are supported by 30 systems and at least 6 un-official or cuff applications. The CIO manages most of these systems. The operation, maintenance, and development costs for CIO-managed systems exceed \$60,000,000 per year. The costs for Homeowner Center (HOC) operated cuff applications are not apparent since they are informally maintained by HOC staff. These run a risk of simply disappearing if the individuals providing the support change jobs or leave the Department. The cuff applications clearly document the incomplete functionality of our current system environment. Owners of the CIO-managed systems are distributed among Single Family Housing, the FHA Comptroller, and the Chief Financial Officer. The systems identified as currently supporting Single Family Housing are shown in Table A.⁵

⁵ The systems identified in this project represent what is believed to be the total universe of systems used by Single Family Housing. Although every effort was made to identify all systems, there may be some small systems in the HOCs that were not accounted for.

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Table A—Existing Single Family Systems/Databases				
Business Function	System/Cuff-Database Name			
Loan Insurance	 Computerized Homes Underwriting System Automated Underwriting System—TOTAL Scorecard The FHA Connection Credit Alert Interactive Voice Response System Title I Insurance System QCED—Quality Control Endorsement Database URS—Underwriting Reports System Single Family Insurance System Mortgage Insurance Certificate Corrections Database Single Family Default Monitoring System File Review System Non-profit Approval Tracking System Reconveyance & Protection Preservation System REO Appraisal Review System REO Uninsurable Database Single Family Acquired Asset Management System 			
Monitoring	 Single Family Acquired Asset Management System Single Family Neighborhood Watch Appraisal Review Access Database Approval, Recertification, Review Tracking System Lender Assessment Subsystem Mortgage Portfolio Analysis System Insurance Accounting Collection System Underwriting Reports System 			
Enforcement	 Lender Assessment Subsystem Mortgage Portfolio Analysis System 			
Planning and Performance Evaluation	 Single Family Neighborhood Watch Consolidated Single Family Statistical System 			
Public and Stakeholder Communications	Public Inquiry Communication Subsystem			
Financial Management	 Single Family Acquired Asset Management System Section 235 Automated Validating and Editing System Computerized Homes Underwriting System Debt Collection Asset Management System Distributive Shares and Refunds Home Equity Conversion Mortgages Single Family Insurance System Claims Subsystem Single Family Mortgage Notes System Title I Insurance and Claims Institution Master File Single Family Premium Collection Subsys. Periodic Single Family Premium Collection Subsys. Upfront 			

Observations About Single Family Housing Systems

A large number of SFH systems perform similar insurance related functions. For example, 17 systems relate to the loan insurance business process, and 9 systems relate to various monitoring activities. There are also separate computer systems for the two types (up-front or periodic) of premium collections.

This tendency to build new systems or new subsystems rather than to improve systems by functional area has resulted in interoperability failures and a large number of interfaces to move data from one system to another ultimately creating redundancies.

This pattern has been expanding in recent years, with a total of 10 new systems having been built by the HOCs and REAC. These HOC systems are not connected to the HUD-managed system inventory, thus necessitating duplicate data entry and manual data update. Many of these systems exchange data with one another, which creates a complex and unwieldy architecture.

Many of the major SFH systems were built in the 1980s (CHUMS, SFIS) and use proprietary software that makes it more difficult to reuse software code (SAMS). These high-volume systems were built for dedicated terminals rather than the modern network desktop where employees and partners use a Web browser to access a number of different systems.

Developing A Target Architecture

The large scale of Single Family Housing's loan insurance business must be kept in mind as the architecture is developed; this is a business with nearly \$500,000,000 in insurance in force. Given that number, in building the target environment for Single Family Housing, several factors must be considered.

- The systems architecture needed to support this business on a day-today basis must be robust and highly scalable to accommodate a high number of simultaneous users and transactions.
- Management decision support systems are critical for assessing new opportunities as well as accommodating program scrutiny. System architectures must allow departmental leaders, program managers, and analysts to drill-down into datasets, export data, and send data by e-mail. Also, periodic generation of datasets should be a function

because HTML reporting mechanisms may be inadequate for complex data formatting and presentation.

- The systems design should recognize the different perspectives held by organizations involved with SFH functions. Some organizations favor systems with more internal controls for minimizing fraud; however, strong internal controls can lead to system rigidity and difficulty of use. Also, excessive monitoring can be counter-productive, whereas the cost reductions realized by GSEs, such as Fannie Mae, have come at least in part from reducing levels of monitoring (eliminating checking the "checkers") when coupled with firm policies to punish program abusers.
- The Single Family Business Process Reengineering Report for the Office of Program Development recommends a number of significant modifications to existing systems, including a new Quality Control database, a PIF database, and a new portfolio management database. Investing large sums for systems that might be consolidated or replaced in the next few years would increase costs and further complicate the modernization effort. Also, the BPR report provides a number of recommendations that are controversial or will require statutory changes (incontestability clause, appraisal changes) that are likely to take years to implement, if they can be implemented at all. These uncertainties could discourage moving forward with an integration plan.

A Target Architecture To Meet These Concerns

Analysis of the information gathered during the course of several weeks revealed that the activities carried out by SFH can be consolidated into a smaller number of functional areas. The figure below shows the mapping between the existing business functions and the consolidated functions.



One or more core modules support each business function in the target architecture. These may be stand-alone systems or parts of larger systems. For example, in the loan insurance function, three basic modules support issuing insurance, processing claims, and managing assets. The table below maps the SFH core business functions to the modules that support them.

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Table B—Business Functions and Modules		
Business Function	Associated Module	
Loan Insurance	 Issue Insurance/Perform Underwriting Service Insurance and Claims Manage Assets Stakeholder Management Reporting Acquisition 	
Business Participant Management	 Participant Approval Participant Monitoring Participant Enforcement Stakeholder Management Reporting Acquisition 	
Business Evaluation	 Planning and Evaluation Internal Controls Stakeholder Management Reporting Acquisition 	
Stakeholder Management	 Stakeholder Management Reporting Acquisition 	
Financial Management	 FHA Subsidiary Ledger Stakeholder Management Reporting Acquisition 	
Direct Loans	Stakeholder ManagementReportingAcquisition	
Grants Management	Stakeholder ManagementReportingAcquisition	

In addition to the core modules that support a single business function, some Single Family Housing crosscutting modules exist. For example, a stakeholder management module addresses a number of functional areas.

Benefits of the SFH Target Architecture

The proposed systems environment offers a number of benefits to SFH and to HUD. Some of these benefits are listed below.

- The Single Family Housing target architecture, when fully implemented, will reduce the number of SFH systems significantly— from approximately 36 systems and databases today to perhaps as few as 7 core modules.
- The findings of the GAO report will be addressed if the systems that are developed as part of this effort truly follow the recommendations provided.
- The new design provides a minimum amount of functional overlap and redundant data among the proposed new systems. This will improve data quality by establishing fewer points of reference for the same information.
- The design of the target environment promotes flexibility and adaptability.
- The design will allow the HOCs to better monitor lenders to detect cases of "flipping."
- The system design parallels SFH organizational divisions, both in headquarters and in the HOCs to help minimize disruption.
- The new systems that are built will integrate with the SFH Subsidiary Ledger.

Conclusion and Next Steps

The EA Team has analyzed the Single Family Housing operation and proposed a target architecture. This target is based on seven identified core modules that will support the Single Family Housing core business. Accepting this target architecture will allow SFH to follow an approved plan for future system development. The actual number of systems or even system requirements may change, but the goals enumerated above should guide this effort toward a consolidation scheme for the existing systems. Single Family Housing devoted \$38 million to maintenance of existing systems for fiscal years 2002 and 2003. An additional \$35 million was

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slated for system development. This data indicates that Single Family Housing can and should reprioritize its development efforts and reprogram an appropriate amount of funds that are intended for existing projects into the development of the target modules. On the basis of the analysis completed and feedback from SFH, it is recommended that this effort address the loan insurance business function first because it encompasses the majority of SFH's transactions.

Appendix A

The Process for Building the SFH Target Architecture

The Enterprise Architecture (EA) Team and staff from the Office of Single Family Housing, Office of Housing Systems and Technology, and the FHA Subsidiary Ledger Project Team developed a target architecture for SFH using a proven methodology. In addition to drawing on the knowledge of subject matter experts who were part of the working group, information was obtained from the EA baseline captured in the Enterprise Architecture Management System (EAMS), the Information Technology Investment Portfolio (ITIP) system, and the Inventory of Automated Systems (IAS). For this task, the team also relied on information that was documented in the *Single Family Housing Target Information Architecture* document. Part of the process of building the target architecture was to reconcile the information in the various systems.

The first step in the process was to develop a target business architecture based on the existing baseline business architecture. An important part of this process was to normalize the level of information that existed for each business function relevant to the SFH operation. For example, some business functions had been decomposed only as far as the business process level, while others had been broken down further into business activities. The working group provided feedback on what activities were part of the business functions and processes carried out by Single Family Housing. Analysis of the baseline information led to the creation of a target business architecture.

After developing the proposed target business architecture, the next step was to develop a target data architecture. The architecture team derived a set of data areas and data classes from the business architecture developed in step one and presented this list to the working group for validation. The working group reviewed this list of data areas and classes and provided feedback on what additions and corrections were necessary.

The third step involved developing a target application architecture. The architecture team first identified the applications currently used by the Office of Single Family Housing. Each application was then mapped to the primary business function that it supports. This list of applications and associated business functions was presented to the working group for verification and validation. After incorporating the feedback received from the working group in this area, the architecture team analyzed the information to find

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redundancy and overlap between the applications. This analysis led to the development of the target business module environment. This target identifies the business modules that support the core business of SFH and identifies opportunities for SFH to leverage SFH crosscutting business functions and HUD- wide efforts.

The final step in the process is to develop the future state direction for SFH. This step will involve prioritizing development activities to ensure that the target business modules are built efficiently. This step will also involve a process flow analysis of existing and proposed business activities to identify areas for improvement.