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Information technology — Systems Security Engineering — Capability Maturity Model (SSE-CMM®)

Technologies de l'information — Ingénierie de sécurité système — Modèle de maturité de capacité (SSE-CMM®)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an Internationa Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 21827 was prepared by the International Systems Security Engineering Association (ISSEA) (formerly the Systems Security Engineering — Capability Maturity Model®[1] Project) and was adopted, under the PAS procedure, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annexes A and B form a normative part of this International Standard. Annex C is for information only.

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Introduction

A wide variety of organizations practice security engineering in the development of computer programs, whether as operating systems software, security managing and enforcing functions, software, middleware of applications programs. Appropriate methods and practices are therefore required by product developers, service providers, system integrators, system administrators, and even security specialists. Some of these organizations deal with high-level issues (e.g., ones dealing with operational use or system architecture), others focus on low-level issues (e.g., mechanism selection or design), and some do both. Organizations may specialize in a particular type of technology, or a specialized context (e.g. at sea).

The SSE-CMM® is designed for all these organizations. Use of the SSE-CMM should not imply that one focus is better than another is or that any of these uses are required. An organization's business focus need not be biassed by use of the SSE-CMM®.

Based on the focus of the organization, some, but not all, of the security engineering practices defined will apply. In addition, the organization may need to look at relationships between different practices within the model to determine their applicability. The examples below illustrate ways in which the SSE-CMM® may be applied to software, systems, facilities development and operation by a variety of different organizations.

Security Service Providers

To measure the process capability of an organization that performs risk assessments, several groups of practices come into play. During system development or integration, one would need to assess the organization with regard to its ability to determine and analyze security vulnerabilities and assess the operational impacts. In the operational case, one would need to assess the organization with regard to its ability to monitor the security posture of the system, identify and analyze security vulnerabilities, and assess the operational impacts.

Countermeasure Developers

In the case of a group that focuses on the development of countermeasures, the process capability of an organization would be characterized by a combination of SSE-CMM® practices. The model contains practices to address determining and analyzing security vulnerabilities, assessing operational impacts, and providing input and guidance to other groups involved (such as a software group). The group that provides the service of developing countermeasures needs to understand the relationships between these practices.

Product Developers

The SSE-CMM® includes practices that focus on gaining an understanding of the customer's security needs. Interaction with the customer is required to ascertain them. In the case of a product, the customer is generic as the product is developed a priori independent of a specific customer. When this is the case, the product marketing group or another group can be used as the hypothetical customer, if one is required.

Practitioners in security engineering recognize that the product contexts and the methods used to accomplish product development are as varied as the products themselves. However, there are some issues related to product and project context that are known to have an impact on the way products are conceived, produced, delivered, and maintained. The following issues in particular have significance for the SSE-CMM®:

- Type of customer base (products, systems, or services);
- Assurance requirements (high vs. low);
- Support for both development and operational organizations.

The differences between two diverse customer bases, differing degrees of assurance requirements, and the impacts of each of these differences in the SSE-CMM® are discussed below. These are provided as an example of how an organization or industry segment might determine appropriate use of the SSE-CMM® in their environment.

Specific Industry Segments

Every industry reflects its own particular culture, terminology, and communication style. By minimizing the role dependencies and organization structure implications, it is anticipated that the SSE-CMM® concepts can be easily translated by all industry segments into their own language and culture.

How Should the SSE-CMM® Be Used?

The SSE-CMM® and the method for applying the model (i.e., appraisal method) are intended to be used as a:
- Tool for engineering organizations to evaluate their security engineering practices and define improvements;
- Method by which security engineering evaluation organizations such as certifiers and evaluators can establish confidence in the organizational capability as one input to system or product security assurance;
- Standard mechanism for customers to evaluate a provider's security engineering capability.

The appraisal techniques can be used in applying the model for self improvement and in selecting suppliers, if the users of the model and appraisal methods thoroughly understand the proper application of the model and its inherent limitations. Additional information on using process assessment can be found in ISO/IEC CD 15504-4 Software Engineering — Process Assessment — Part 4: Guidance on use for Process Improvement and Process Capability Determination.

Benefits of Using the SSE-CMM®

The trend for security is a shift from protecting classified government data to a broader spectrum of concerns including financial transactions, contractual agreements, personal information, and the Internet. A corresponding proliferation of products, systems, and services that maintain and protect information has emerged. These security products and systems typically come to market in one of two ways: through lengthy and expensive evaluation or without evaluation. In the former case, trusted products often reach the market long after their features are needed and secure systems are being deployed that no longer address current threats. In the latter, acquirers and users must rely solely on the security claims of the product or system developer or operator. Further, security engineering services traditionally were often marketed on this caveat emptor basis.

This situation calls for organizations to practice security engineering in a more mature manner. Specifically, the following qualities are needed in the production and operation of secure systems and trusted products:
- Continuity - knowledge acquired in previous efforts is used in future efforts;
- Repeatability - a way to ensure that projects can repeat a successful effort;
- Efficiency - a way to help both developers and evaluators work more efficiently;
- Assurance - confidence that security needs are being addressed.

To provide for these requirements, a mechanism is needed to guide organizations in understanding and improving their security engineering practices. To address these needs, the SSE-CMM® is being developed to advance the state of the practice of security engineering with the goal of improving the quality and availability of and reducing the cost of delivering secure systems, trusted products, and security engineering services. In particular, the following benefits are envisioned:

To Engineering Organizations:

Engineering organizations include System Integrators, Application Developers, Product Vendors, and Service Providers. Benefits of the SSE-CMM® to these organizations include:
- Savings with less rework from repeatable, predictable processes and practices;
- Credit for true capability to perform, particularly in source selections;
- Focus on measured organizational competency (maturity) and improvements.

To Acquiring Organizations:

Acquirers include organizations acquiring systems, products, and services from external/internal sources and end users. Benefits of the SSE-CMM® to these organizations include:
- Reusable standard Request for Proposal language and evaluation means;
- Reduced risks (performance, cost, schedule) of choosing an unqualified bidder;
- Fewer protests due to uniform assessments based on industry standard;
- Predictable, repeatable level of confidence in product or service.

To Evaluation Organizations:

Evaluation organizations include System Certifies, System Accreditors, Product Evaluators, and Product Assessors. Benefits of the SSE-CMM® to these organizations include:

- Reusable process appraisal results, independent of system or product changes;
- Confidence in security engineering and its integration with other disciplines;
- Capability-based confidence in evidence, reducing security evaluation workload.

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1 Scope

The SSE-CMM® is a process reference model. It is focussed upon the requirements for implementing security in a system or series of related systems that are the ITS domain. Within the ITS domain the SSE-CMM® Model is focussed on the processes used to achieve ITS, most specifically on the maturity of those processes. There is no intent within the SSE-CMM® Model to dictate a specific process to be used by an organization, let alone a specific methodology. Rather the intent is that the organization making use of the SSE-CMM® Model should use its existing processes, be those processes based upon any other ITS guidance document. The scope encompasses:

- the system security engineering activities for a secure product or a trusted system addressing the complete lifecycle of: concept definition, requirements analysis, design, development, integration, installation, operation, maintenance end de-commissioning;
- requirements for product developers, secure systems developers and integrators, organizations that provide computer security services and computer security engineering;
- applies to all types and sizes of security engineering organizations from commercial to government and the academe.

While the SSE-CMM® is a distinct model to improve and assess security engineering capability, this should not imply that security engineering should be practised in isolation from other engineering disciplines. On the contrary, the SSE-CMM® promotes such integration, taking the view that security is pervasive across all engineering disciplines (e.g., systems, software and hardware) and defining components of the model to address such concerns. The Common Feature "Coordinate Security Practices" recognizes the need to integrate security with all disciplines and groups involved on a project or within an organization. Similarly, the Process Area "Coordinate Security" defines the objectives and mechanisms to be used in coordinating the security engineering activities.

This International Standard has a relationship to TR 15504, particularly part 2, as both are concerned with process improvement and capability maturity assessment. However, TR 15504 is specifically focussed on software processes, whereas the SSE-CMM is focussed on security.

This International Standard has a closer relationship with the new versions of 15504, particularly CD 15504-2, and is compatible with its approaches and requirements.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 12207, *Information technology — Software life cycle processes*

ISO/IEC TR 13335-1, *Information technology — Guidelines for the management of IT Security — Part 1: Concepts and models for IT Security*

ISO/IEC 15288, *Systems engineering — System life cycle processes*

ISO/IEC TR 15504-2, *Information technology — Software process assessment — Part 2: A reference model for processes and process capability*

ISO/IEC TR 15504-4, *Information technology — Software process assessment — Part 4: Guide to performing assessments*

ISO/IEC 17799: 2000, *Information technology — Code of practice for information security management*