

RE Framework

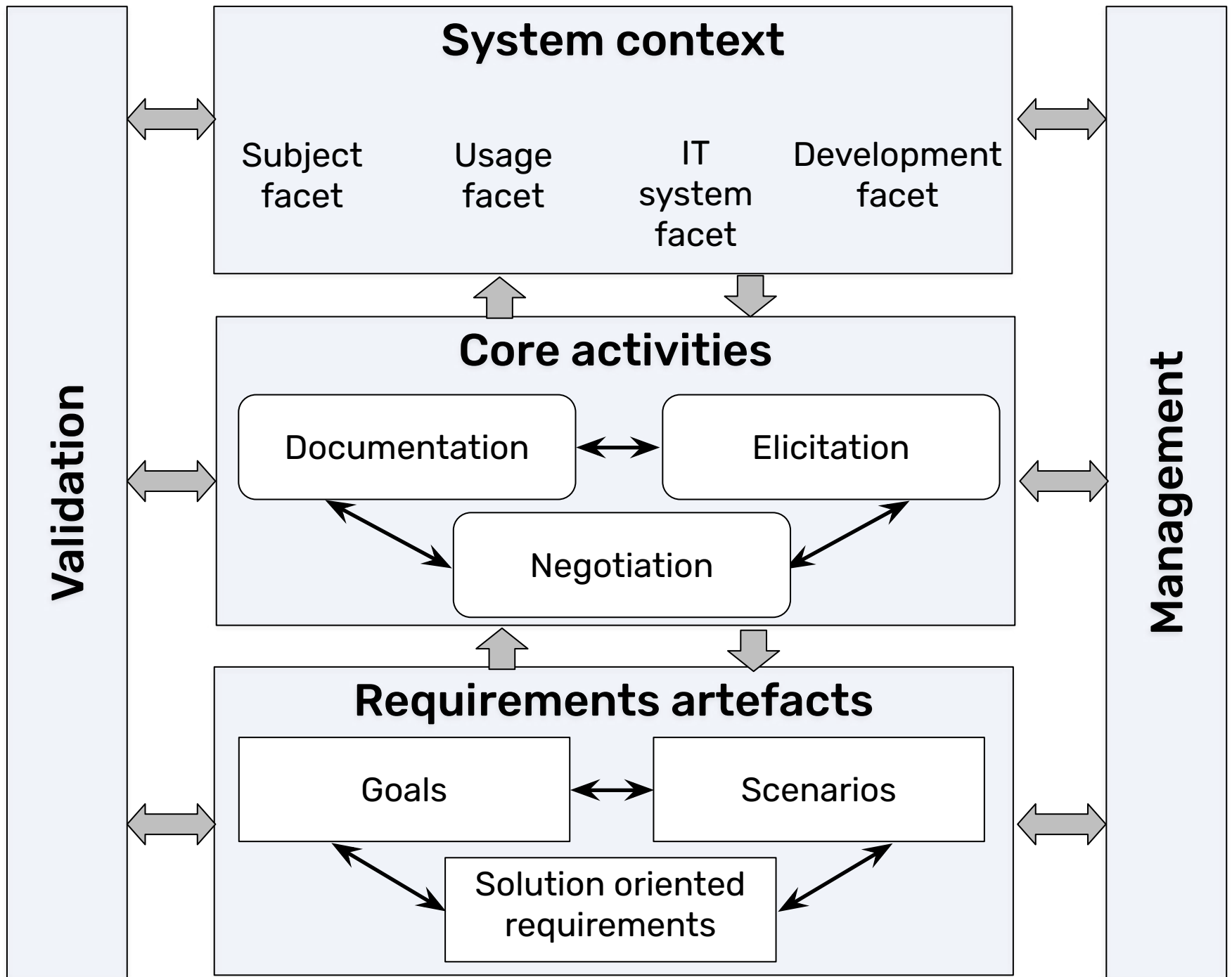
Elicitation

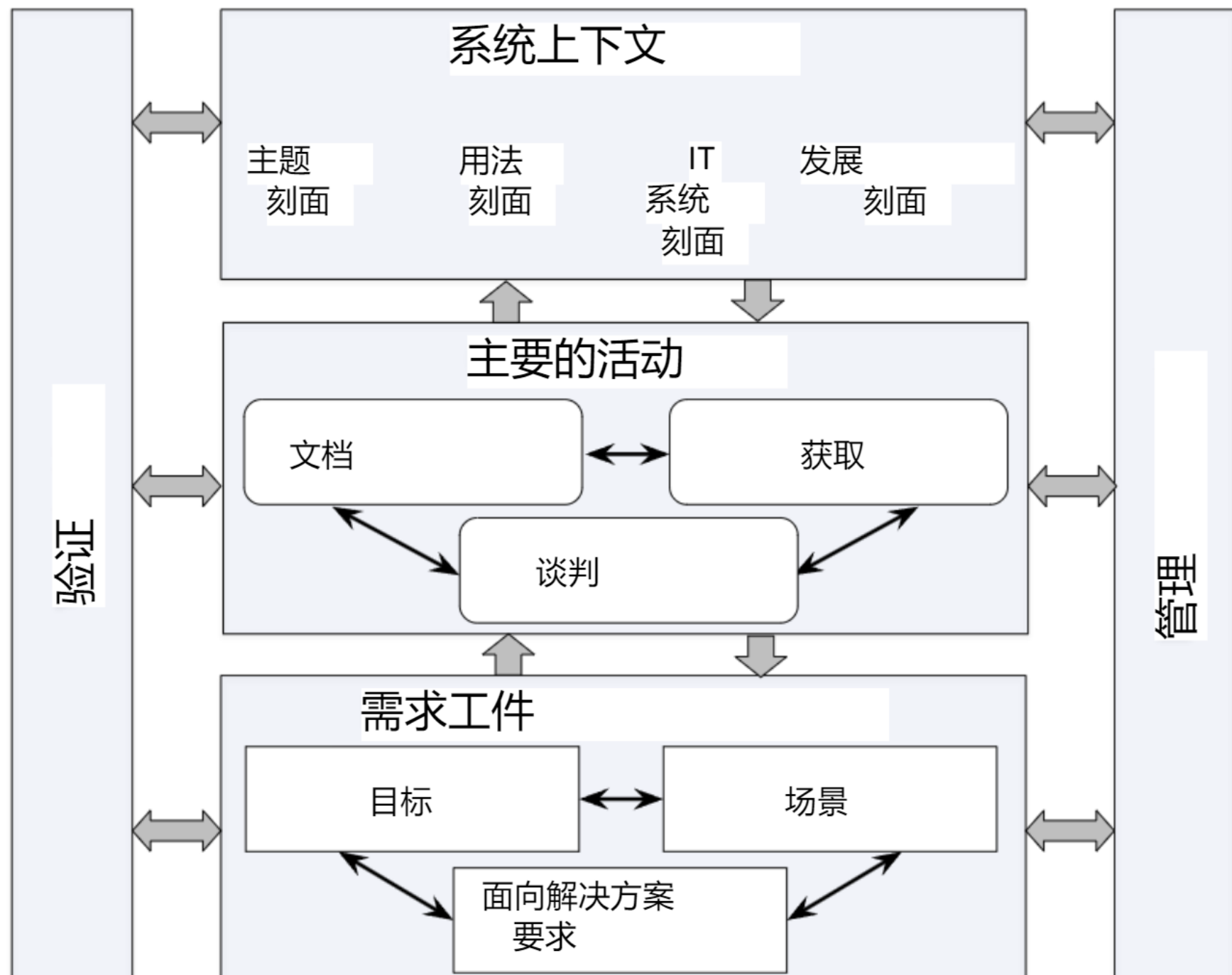
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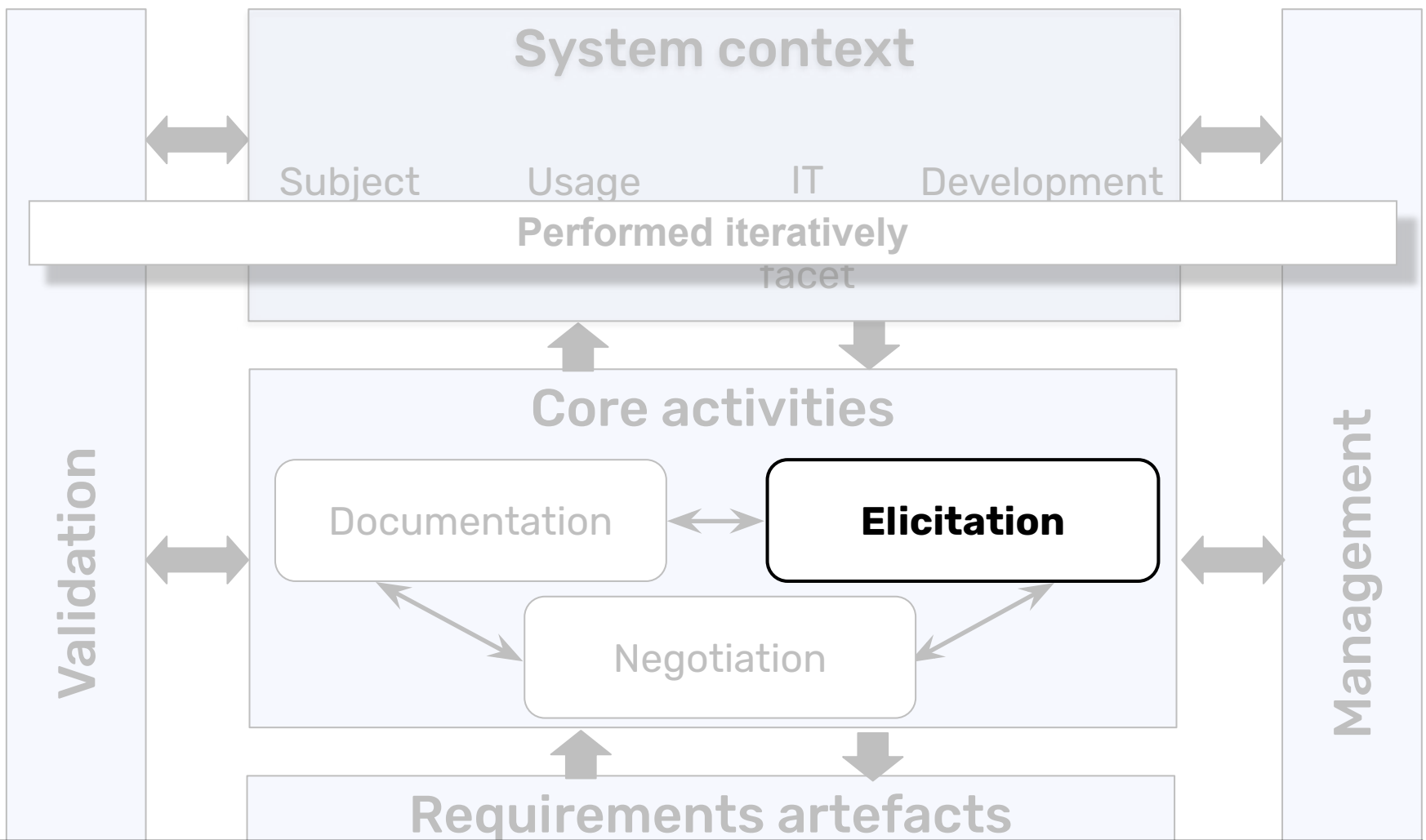
需求工程

可再生能源框架

启发







Achieve progress in the **specification dimension** by eliciting new requirements as well as detailed information about existing requirements

- Elicit all requirements at the level of detail for the system to be developed

系统上下文

主题
剖面

用法
剖面
迭代执行

IT
系统
剖面

发展
剖面

主要的活动

文档

获取

谈判

需求工件

通过引出新需求以及有关现有需求的详细信息，在规范维度取得进展
目标场景

- 引出要开发的系统的所有详细需求
面向解决方案
要求

验证

细化

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- Eliciting Requirements - Examples
- Criteria for good requirements

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- 引出需求 - 示例 • 良好需求的标准

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- **Eliciting Requirements - Examples**
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- 引出需求 - 示例
- 良好要求的标准

Requirement Examples

Various items that can comprise requirements:

1. External Interface Requirements

Logical characteristics of each interface between the software product and the

1. User Interfaces (required screen formats, page or window layouts, report contents, etc)
 2. Hardware components (number of ports, instruction sets, etc)
 3. Software Interfaces (using other required software products and interfaces with the system eg (e.g., data management system integration)
 4. Communication Interfaces
- ... of the system

2. Functional Requirements

Actions that must take place in the software in accepting and processing the inputs and in processing and generating the outputs.

Generally listed as *"shall"* statements starting with *"The system shall..."*

3. Performance Requirements

Numerical requirements placed on the software or on human interaction with the software as a whole

Remember to state this in measurable terms!

4. Design Constraints

Requirements derived from existing standards or hardware limitations

5. Software System Attributes

1. Reliability: establish the required reliability of the software system
2. Availability: guarantee a defined availability level for the entire system
3. Security: protect the software from accidental or malicious access, use, modification, destruction, or disclosure
4. Maintainability: ease of maintenance of the software itself
5. Portability: ease of porting the software to other host machines and/or operating systems

需求示例

可以构成要求的各种项目：

1. 外部接口要求 各接口逻辑特性

软件产品和 1. 用户界面（所需的屏幕格式、

页面或窗口布局、报告内容等） 2. 硬件组件（端口数量、指令集等） 3. 软件接口（使用其他所需的软件产品和与系统的接口，例如（例如，数据管理系统集成） 4. 系统的通信接口...

2. 功能要求 软件中必须执行的操作

接受和处理输入以及处理和生成输出。通常列为“应”语句，以“系统应... ..”开头

3. 性能要求 对软件或软件提出的数值要求

关于人类与整个软件的交互

请记住用可衡量的术语来表述这一点！

4. 设计约束 源自现有标准或

硬件限制

五、软件系统属性 1、可靠性：建立软件系统所需的可靠性

2. 可用性：保证整个系统达到规定的可用性水平 3. 安全性：保护软件免遭意外或恶意访问、使用、修改、破坏或泄露 4. 可维护性：软件本身易于维护 5. 可移植性：易于维护将软件移植到其他主机和/或操作系统

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- 良好要求的标准

Typical mistakes

- **Noise**

- text that carries no relevant information to any feature of the problem.

- **Silence**

- a feature that is not covered by any text.

- **Over-specification**

- text that describes a detailed design decision, rather than the problem.

- **Contradiction**

- text that defines a single feature in a number of incompatible ways.

- **Ambiguity**

- text that can be interpreted in at least two different ways.

- **Forward reference**

- text that refers to a terms or features yet to be defined.

- **Wishful thinking**

- text that defines a feature that cannot possibly be validated.

- **Requirements on users**

- Cannot require users to do certain things, can only assume that they will

- **Jigsaw puzzles**

- distributing key information across a document and then cross-referencing

- **Duckspeak requirements**

- Requirements that are only there to conform to standards

- **Unnecessary invention of terminology**

- E.g. 'user input presentation function'

- **Inconsistent terminology**

- Inventing and then changing terminology

- **Putting the onus on the developers**

- i.e. making the reader work hard to decipher the intent

- **Writing for the hostile reader**

- There are fewer of these than friendly readers

典型错误

- 噪音
 - 不包含与问题的任何特征相关的信息的文本。
- 安静
 - 任何文本都没有涵盖的功能。
- 超规格
 - 描述详细设计决策而不是问题的文本。
- 矛盾
 - 以多种不兼容的方式定义单个功能的文本。
- 歧义
 - 可以用至少两种不同方式解释的文本。
- 前向参考
 - 涉及尚未定义的术语或功能的文本。
- 妄想
 - 定义无法验证的功能的文本。
- 对用户的要求
 - 不能要求用户做某些事情，只能假设他们会做
- 拼图
 - 在整个文档中分发关键信息，然后交叉引用
- 鸭语要求
 - 仅用于符合标准的要求
- 不必要的发明
 - 术语
 - 例如‘用户输入呈现功能’
- 术语不一致
 - 发明然后改变术语
- 把责任推给开发商
 - 即让读者努力解读意图
- 为敌对读者写作
 - 这样的人比友好的读者少

Do not write like this



- **Ambiguity – *or***

- *The same subsystem shall also be able to generate visible or audible caution or warning signal for the attention of security or business analyst*

- **Multiple requirements – *and, or, with, also***

- *The warning lamp shall light up when system intrusions is detected and the current workspace or input shall be saved*

不要这样写



- 歧义——或者

- 同一子系统还应能够生成可见或可听的警告或警告信号，以引起安全或业务分析师的注意

- 多重要求 - 和、或、与、也

- 当检测到系统入侵时，警告灯会亮起，并保存当前工作空间或输入

Do not write like this



- **Let-out clauses**

if, when, except, unless, although, always

- *The fire alarm shall always be sounded **when** the smoke is detected, **unless** the alarm is being tested **when** the antivirus is deployed*

- **Long rambling sentences**

- *Provided that the designated input signals from the specified devices are received in the correct order where the systems is able to differentiate the designators, the security solution should comply with the required framework of Section 3.1.5 to indicate the desired security states*

不要这样写



- 出租条款
如果、当、除了、除非、虽然、总是
 - 当检测到烟雾时，火灾警报器应始终响起，除非在部署防病毒软件时正在测试警报器
- 长篇大论的句子
 - 如果以正确的顺序接收来自指定设备的指定输入信号，并且系统能够区分指示符，则安全解决方案应符合第 3.1.5 节所需的框架，以指示所需的安全状态

Do not write like this



- **System design:**
no names of components, materials, software objects/procedures, database fields
 - *The antenna shall be capable of receiving FM signals, using a copper core with nylon armoring and a waterproof hardened rubber shield*
- **Mix of requirements and design:**
no references to system, design, testing, or installation
 - *The user shall be able to view the current selected channel number which shall be displayed in 14pt Swiss type on an LCD panel tested to standard 657-89 and mounted with shockproof rubber washers*

不要这样写



- 系统设计：
没有组件、材料、软件对象/过程、数据库字段的名称
 - 天线应能接收FM信号，采用铜芯尼龙铠装，防水硬化橡胶盾
- 需求和设计的混合：没有提及系统、设计、测试或安装
 - 用户应能够查看当前选择的频道号，该频道号以 14 点瑞士字显示在 LCD 上
面板经过标准 657-89 测试并安装有防震橡胶垫圈

Do not write like this



- **Speculation**

usually, generally, often normally, typically

- *Users normally require early indication of intrusion into the system*

- **Vague, undefinable terms**

user-friendly, versatile, approximately, as possible, efficient, improved, high-performance, modern

- *Security-related messages should be versatile and user-friendly*
- *The OK status indicator lamp shall be illuminated as soon as possible after system security self-check is completed*

不要这样写



- 投机
通常，通常，通常，通常，通常
 - 用户通常需要尽早发现系统被入侵的情况
- 模糊、无法定义的术语
用户友好、多功能、近似、尽可能、高效、改进、高性能、现代
 - 安全相关信息应具有通用性和用户友好性。
 - 系统安全自检完成后，OK 状态指示灯应尽快亮起

Do not write like this



- **Wishful thinking**

100% reliable/ safe/ secure. Handle all unexpected failures. Please all users. Run on all platforms. Never fail. Upgrade to all future situations.

- *The gearbox shall be 100% secure in normal operation.*
- *The network shall handle all unexpected errors without crashing.*

不要这样写



- 一厢情愿的想法 **100%** 可靠/安全/放心。处理所有意外的失败。请各位用户。在所有平台上运行。永远不要失败。升级到所有未来的情况。
 - 齿轮箱正常运行时应**100%**安全。
 - 网络应处理所有意外错误而不会崩溃。

Good requirements



- **Use simple direct sentences**

- *Security analyst should be able to view system status*

- **Use a limited vocabulary**

- *Security analyst should be able to change the infected component in less than 12 hours*
- *Security analyst should be able to reconfigure the infected component in less than 12 hours*

良好的要求



- 使用简单的直接句子
 - 安全分析师应该能够查看系统状态
- 使用有限的词汇量
 - 安全分析师应能够在 12 小时内更改受感染的组件 ◦ 安全分析师应能够在 12 小时内重新配置受感染的组件

Good requirements



- **Identify the type of user who wants each requirements**
 - *The navigator shall be able to...*
- **Focus on stating result**
 - *... view storm clouds by radar ...*
- **Define verifiable criteria**
 - *... at least 100 km ahead.*
 - *Acceptance criterion: Aircraft flying at 800km/h at 10.000 meters towards a known storm cloud indicated by meteorology satellite report; storm cloud is detected at a range of at least 100 km.*

良好的要求



- 确定需要每个需求的用户类型
导航员应能够...
- 专注于陈述结果
...通过雷达查看风暴云...
- 定义可验证的标准
... 至少前方 100 公里。

验收标准：飞机以 800 公里/小时的速度在 10,000 米高度飞向气象卫星报告显示的已知风暴云；在至少 100 公里的范围内检测到风暴云。

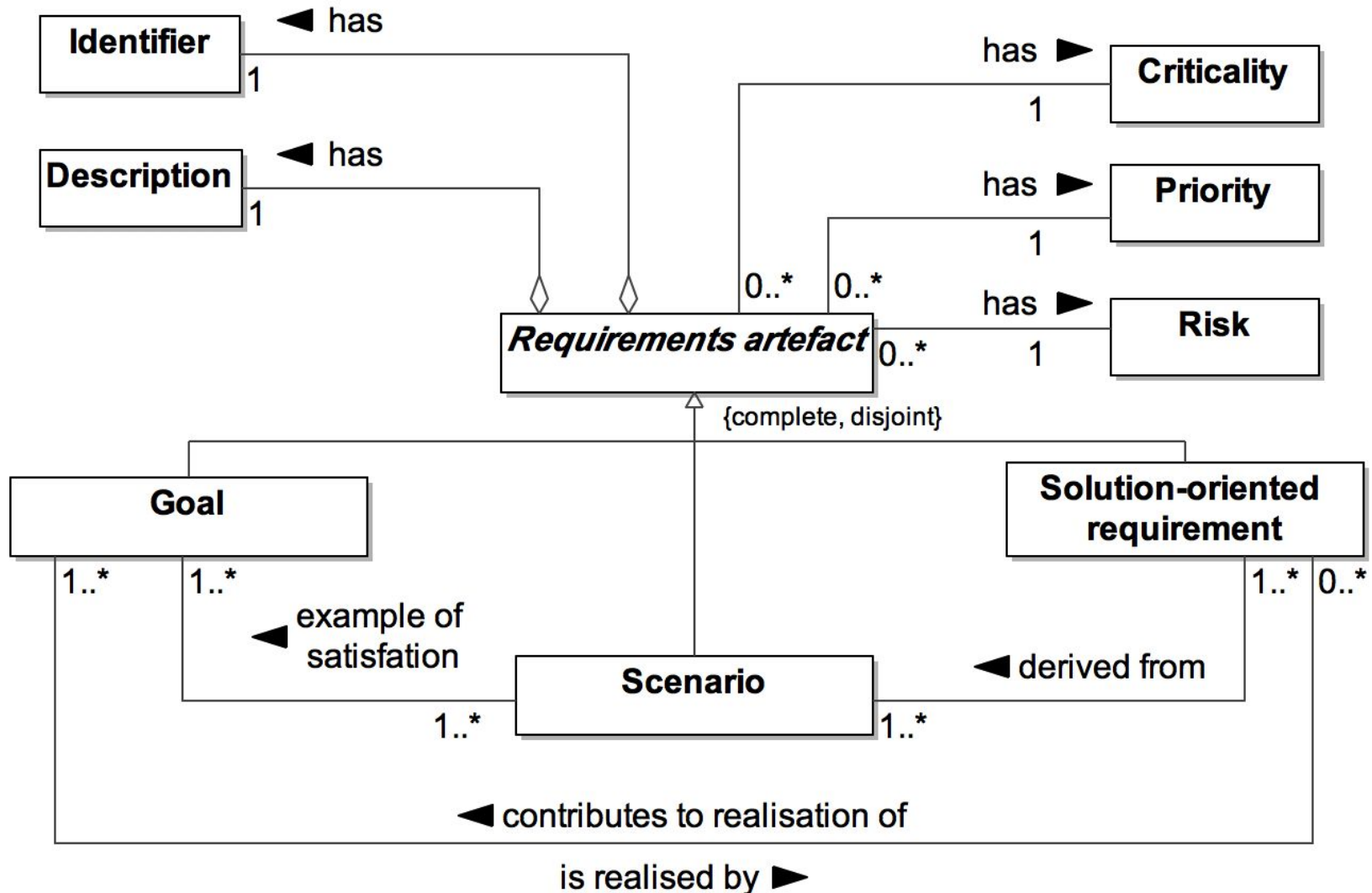
Criteria for Writing Good Requirements

- **What, not how (external observability)**
 - Avoid premature design or implementation decisions
- **Understandability, clarity (not ambiguous)**
- **Cohesiveness (one thing per requirement)**
- **Testability**
 - Somehow possible to test or validate whether the requirement has been met, clear acceptance criteria
 - Often requires quantification, this is more difficult for security than e.g. for performance
 - "The response time of function F should be max 2 seconds"
 - "The security of function F should be at least 99.9 %" ???

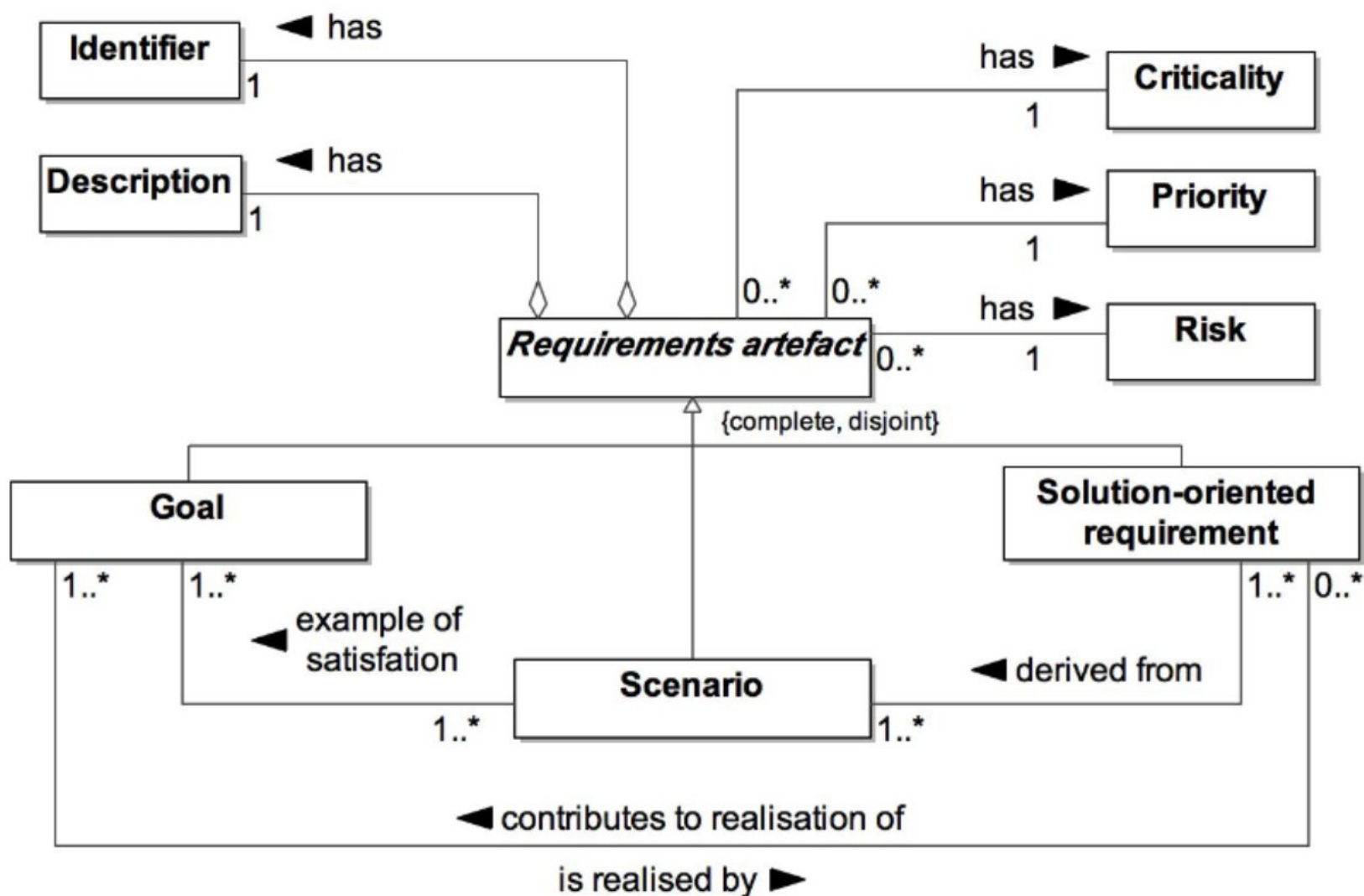
编写良好需求的标准

- 什么，而不是如何（外部可观察性）
 - 避免过早的设计或实施决策
- 可理解性、清晰性（不含糊）
- 凝聚力（每个要求一件事）
- 可测试性
 - 以某种方式可以测试或验证是否满足要求，明确的验收标准
 - 通常需要量化，这对于安全性来说比例如对于性能 “ 功能 F 的响应时间应最多为 2 秒” “ 功能 F 的安全性应至少为 99.9 %” ???

Documenting requirements artefacts

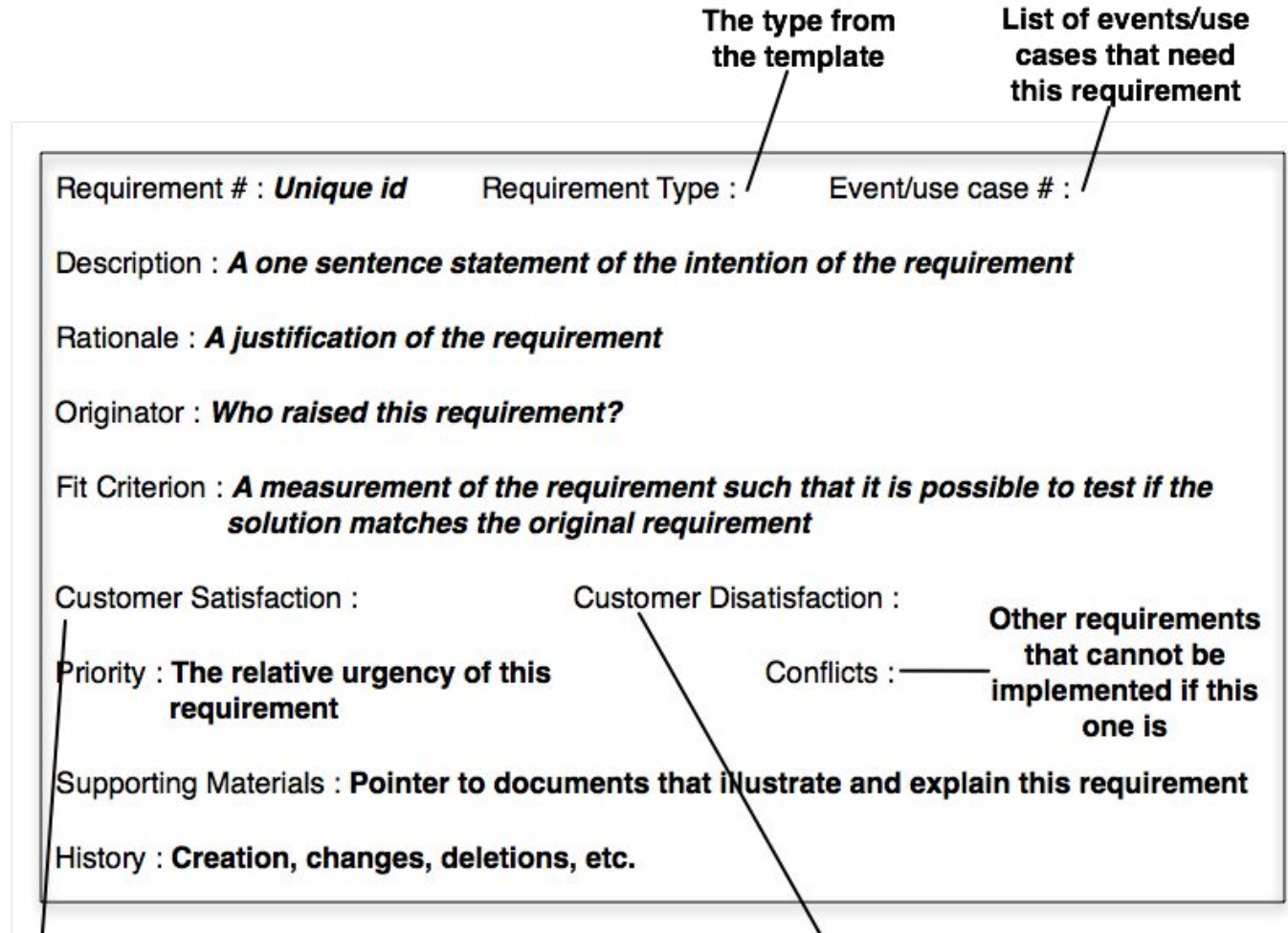


记录需求工件



Requirement Shell

Volere template, 2010



The diagram shows a 'Requirement Shell' template with various fields. Annotations with arrows point to specific fields: 'The type from the template' points to 'Requirement Type :', 'List of events/use cases that need this requirement' points to 'Event/use case # :', 'Degree of stakeholder happiness...' points to 'Customer Satisfaction :', and 'Measure of stakeholder unhappiness...' points to 'Customer Disatisfaction :'. The template fields are as follows:

Requirement # : **Unique id** Requirement Type : Event/use case # : List of events/use cases that need this requirement

Description : **A one sentence statement of the intention of the requirement**

Rationale : **A justification of the requirement**

Originator : **Who raised this requirement?**

Fit Criterion : **A measurement of the requirement such that it is possible to test if the solution matches the original requirement**

Customer Satisfaction : Customer Disatisfaction : Other requirements that cannot be implemented if this one is

Priority : **The relative urgency of this requirement** Conflicts :

Supporting Materials : **Pointer to documents that illustrate and explain this requirement**

History : **Creation, changes, deletions, etc.**

Degree of stakeholder happiness if this requirement is successfully implemented.
Scale from 1 = uninterested to 5 = extremely pleased.

Measure of stakeholder unhappiness if this requirement is not part of the final product.
Scale from 1 = hardly matters to 5 = extremely displeased.

需求外壳

想要模板, 2010

Requirement # : *Unique id* **Requirement Type :** **Event/use case # :**

Description : *A one sentence statement of the intention of the requirement*

Rationale : *A justification of the requirement*

Originator : *Who raised this requirement?*

Fit Criterion : *A measurement of the requirement such that it is possible to test if the solution matches the original requirement*

Customer Satisfaction : **Customer Disatisfaction :** **Other requirements that cannot be implemented if this one is**

Priority : *The relative urgency of this requirement* **Conflicts :**

Supporting Materials : *Pointer to documents that illustrate and explain this requirement*

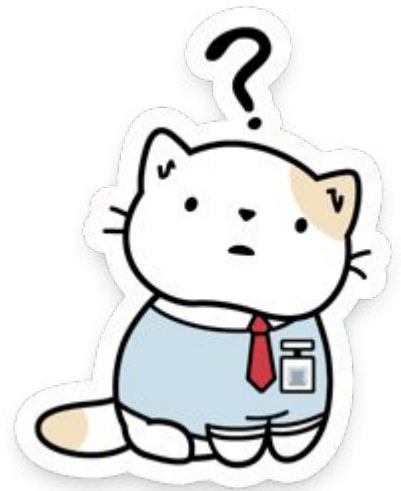
History : *Creation, changes, deletions, etc.*

**Degree of stakeholder happiness if this requirement is successfully implemented.
Scale from 1 = uninterested**

**Measure of stakeholder unhappiness if this requirement is not part of the final product.
Scale from 1 = hardly matters to 5 = extremely displeased.**

Take Home!

- Requirements specification
- Criteria for good requirements



帶回家！

- 要求规范
- 良好要求的标准



Exercise

锻炼

Do these security requirements correspond to the “criteria of good requirements”? If not, please refine them so that they would correspond to the “criteria of good requirements”.

这些安全要求是否符合“良好要求的标准”？如果没有，请对其进行改进，使其符合“良好要求的标准”。

SecReq.1: Automation of the receipt generation or checking fuel capacity and sold amount of fuel as often as possible.

SecReq.2: Cash register computer must compare data about company car / employee ID to ERP and give warning if there is a mismatch.

SecReq.3: IT department must follow security advisories and patch the vulnerable systems, given that solutions are available.

SecReq.4: Implementing at least two workplaces for serving customers in filling station.

SecReq.5: Appropriate trainings shall be provided to all employees of PowerAB with regards to information security awareness.

SecReq.6: Database backup server accounts should be sufficiently protected against unauthorized access.

SecReq.7: IT managers should plan the placement of card readers near 24/7 cameras, which are monitored from a security officer.

SecReq.8: Have a backup server for redundancy and push uptime to near 100%.

SecReq.9: Using better security applications.

SecReq.10: The firewall should continuously monitor the communication channel and block suspicious software while transmitting message from account department to personnel department.

SecReq.1：自动生成收据或尽可能频繁地检查燃料容量和燃料销售量。

SecReq.2：收银机计算机必须将公司车辆/员工 ID 的数据与 ERP 进行比较，如果不匹配则发出警告。

SecReq.3：如果有可用的解决方案，IT 部门必须遵循安全建议并修补易受攻击的系统。

SecReq.4：在加油站设立至少两个工作场所为顾客提供服务。

SecReq.5：应向 PowerAB 的所有员工提供有关信息安全意识的适当培训。

SecReq.6：应充分保护数据库备份服务器帐户，防止未经授权的访问。

SecReq.7：IT 经理应规划将读卡器放置在 24/7 摄像头附近，并由安全人员进行监控。

SecReq.8：拥有一台备份服务器以实现冗余，并将正常运行时间推至接近 100%。

SecReq.9：使用更好的安全应用程序。

SecReq.10：在从会计部门向人事部门传输消息时，防火墙应持续监控通信通道并阻止可疑软件。

SecReq.1: Automation of the receipt generation or checking fuel capacity and sold amount of fuel as often as possible.

SecReq.2: Cash register computer must compare data about company car / employee ID to ERP and give warning if there is a mismatch.

SecReq.3: IT department must follow security advisories and patch the vulnerable systems, given that solutions are available.

SecReq.1：自动生成收据或尽可能频繁地检查燃料容量和燃料销售量。

SecReq.2：收银机
计算机必须将公司汽车/员工 ID 的数据与 ERP 进行比较，如果不匹配则发出警告。

SecReq.3：如果有可用的解决方案，IT 部门必须遵循安全建议并修补易受攻击的系统。

SecReq.1: Automation of the receipt generation or checking fuel capacity and sold amount of fuel as often as possible.

SecReq.2: Cash register computer must compare data about company car / employee ID to ERP and give warning if there is a mismatch.

SecReq.3: IT department must follow security advisories and patch the vulnerable systems, given that solutions are available.

SecReq.1.1: Fuel system should check fuel capacity

SecReq.1.2: Receipt system should generate receipts

SecReq.2: Cash register computer should notify attendant about mismatch between car number and employee ID

SecReq.3: IT department should patch PowerAB software systems

SecReq.1：自动生成收据或尽可能频繁地检查燃料容量和燃料销售量。

SecReq.2：收银机
计算机必须将公司汽车/员工 ID 的数据与 ERP 进行比较，如果不匹配则发出警告。

SecReq.3：如果有可用的解决方案，IT 部门必须遵循安全建议并修补易受攻击的系统。

SecReq.1.1：燃油系统应检查燃油容量
SecReq.1.2：收据系统应生成收据

SecReq.2：收银机
计算机应通知
服务员关于不匹配
车号之间
员工ID

SecReq.3：IT 部门应修补
PowerAB 软件系统

SecReq.4: Implementing at least two workplaces for serving customers in filling station.

SecReq.5: Appropriate trainings shall be provided to all employees of PowerAB with regards to information security awareness.

SecReq.6: Database backup server accounts should be sufficiently protected against unauthorized access.

SecReq.4: 在加油站设立至少两个工作场所为顾客提供服务。

SecReq.5: 应向 PowerAB 的所有员工提供有关信息安全意识的适当培训。

SecReq.6: 应充分保护数据库备份服务器帐户，防止未经授权的访问。

SecReq.4: Implementing **at least two** workplaces for serving customers in filling station.

SecReq.5: **Appropriate** trainings shall be provided to **all** employees of PowerAB with regards to information security awareness.

SecReq.6: Database backup server accounts should be **sufficiently** protected against unauthorized access.

SecReq.4: Management should create two workplaces for serving customers.

SecReq.5 Management should provide security awareness training for the PowerAB employees.

SecReq.6: Database backup server accounts should be protected against unauthorized access.

SecReq.4: 在加油站设立至少两个工作场所为顾客提供服务。管理层应创建两个工作场所服务客户。

SecReq.5: 应向 PowerAB 的所有员工提供有关信息安全意识的适当培训。

SecReq.5 管理层应提供安全意识
PowerAB 培训
雇员。

SecReq.6: 应充分保护数据库备份服务器帐户，防止未经授权的访问。

SecReq.6: 数据库备份
应保护服务器帐户免受未经授权的访问。

SecReq.7: IT managers should plan the placement of card readers near 24/7 cameras, which are monitored from a security officer.

SecReq.8: Have a backup server for redundancy and push uptime to near 100%.

SecReq.7: IT 经理
应该计划放置
接近 24/7 的读卡器数量
相机, 它们是
由保安监控
官。

SecReq.8: 进行备份
服务器实现冗余并将正常运行
时间推至接近 100%。

SecReq.7: IT managers should plan the **placement** of card readers near **24/7** cameras, which are monitored from a security officer.

SecReq.8: **Have a backup** server for redundancy **and** push uptime to **near 100%**.

SecReq.7: Security officer should monitor the card readers.

SecReq.8: The backup server should ensure the uptime of 99.1%.

SecReq.7: IT 经理
应该计划放置
接近 24/7 的读卡器数量
相机, 它们是
由保安监控
官。

SecReq.8: 进行备份
服务器用于冗余和
将正常运行时间推至接近 100%。

SecReq.7: 安全官员
应该监控卡
读者。

SecReq.8: 备份
服务器应保证99.1%的正常
运行时间。

SecReq.9: Using better security applications.

SecReq.10: The firewall should continuously monitor the communication channel and block suspicious software while transmitting message from account department to personnel department.

SecReq.9: 更好地使用
安全应用程序。

SecReq.10: 防火墙
应不断地
监控通讯
通道和块
可疑软件同时
传送消息来自
会计部转人事部。

SecReq.9: Using better security applications.

SecReq.9: "I do not know how to fix it !!!"

SecReq.10: The firewall should **continuously** monitor the communication channel **and** block **suspicious** software **while** transmitting message from account department to personnel department.

SecReq.10.1: The firewall should monitor the communication channel.

SecReq.10.2: The firewall should block the untrusted software.

Explain "untrusted"!

SecReq.9: 更好地使用
安全应用程序。

SecReq.9: “ 我不知道
怎么解决!!! ”

SecReq.10: 防火墙
应不断地
监控通讯
通道和块
可疑软件同时
传送消息来自
会计部门至
人事部门。

SecReq.10.1: 防火墙
应监控
沟通渠道。

SecReq.10.2: 防火墙
应该阻止不受信任的
软件。

解释一下“ 不可信” !

Exercise

- The application shall verify the identity of all of its users before allowing them to use all its capabilities
- The system shall let users to log in with passwords of at least 8 characters, containing both small and capital letters, numbers and special signs
- The system shall use Norton antivirus protection
- The application shall disinfect any file found to contain a harmful program if disinfection is possible
- The system shall encrypt all confidential data using the RSA algorithm

锻炼

- 应用程序应在允许所有用户使用其所有功能之前验证其身份
- 系统应允许用户使用至少8个字符的密码登录，其中包含大小写字母、数字和特殊符号
- 系统应使用诺顿防病毒保护
- 如果可以消毒，应用程序应对发现包含有害程序的任何文件进行消毒
- 系统应使用RSA算法对所有机密数据进行加密

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