- 품질 요구사항 -

Boot Loader

조 용 진

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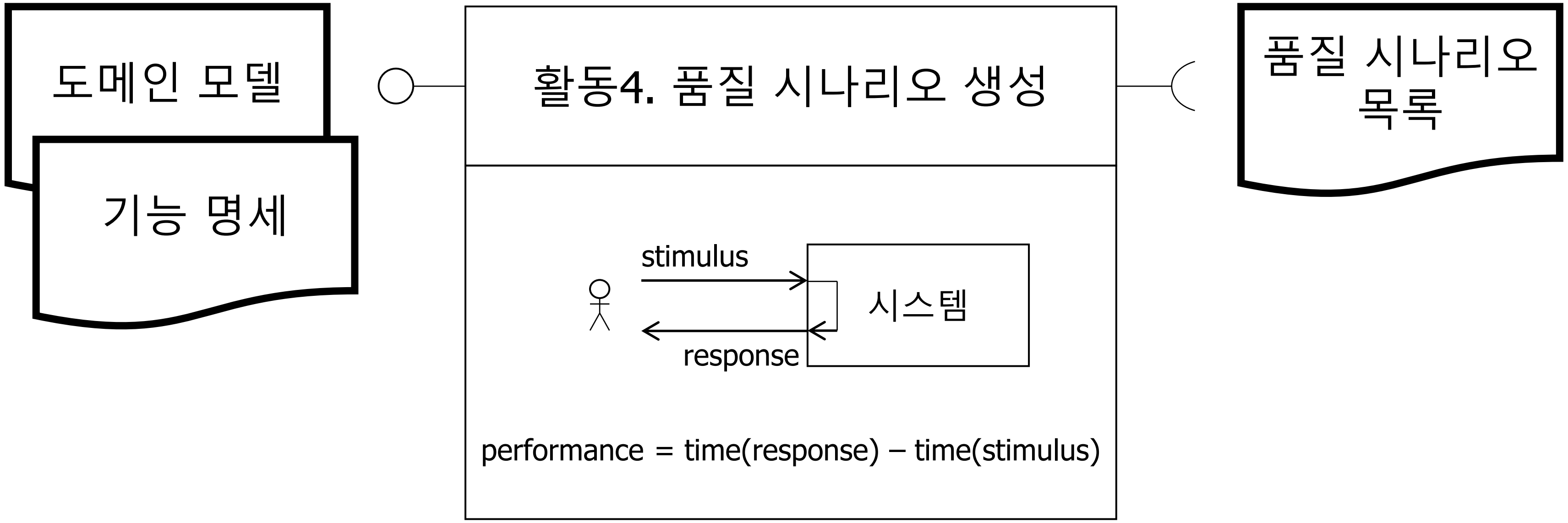
주식회사 보이는 소프트웨어 연구소
http://www.bosornd.com

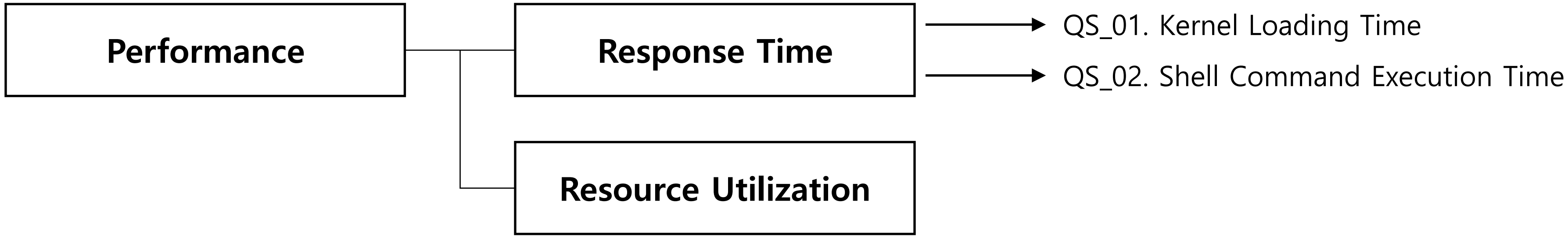
활동4. 품질 시나리오 생성

목적	시스템의 품질을 측정할 수 있는 시나리오를 생성한다.



performance = time(response) – time(stimulus)

활동4. 품질 시나리오 생성



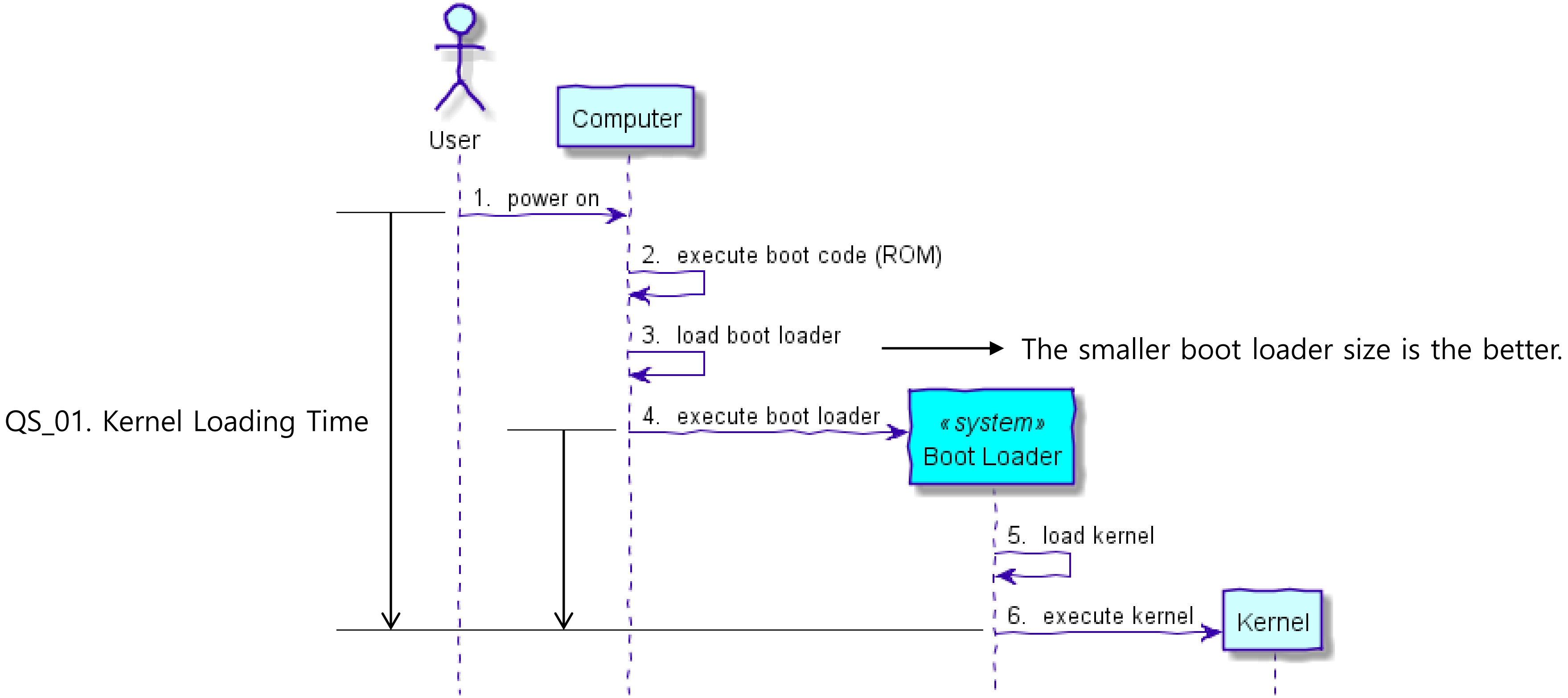
Performance

Response Time

Resource Utilization

QS_01. Kernel Loading Time

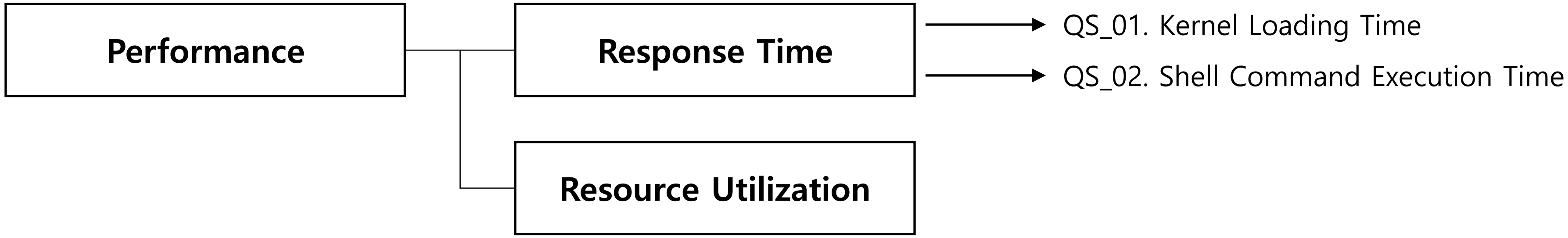
QS_02. Shell Command Execution Time



The smaller boot loader size is the better.

QS_01. Kernel Loading Time

활동4. 품질 시나리오 생성



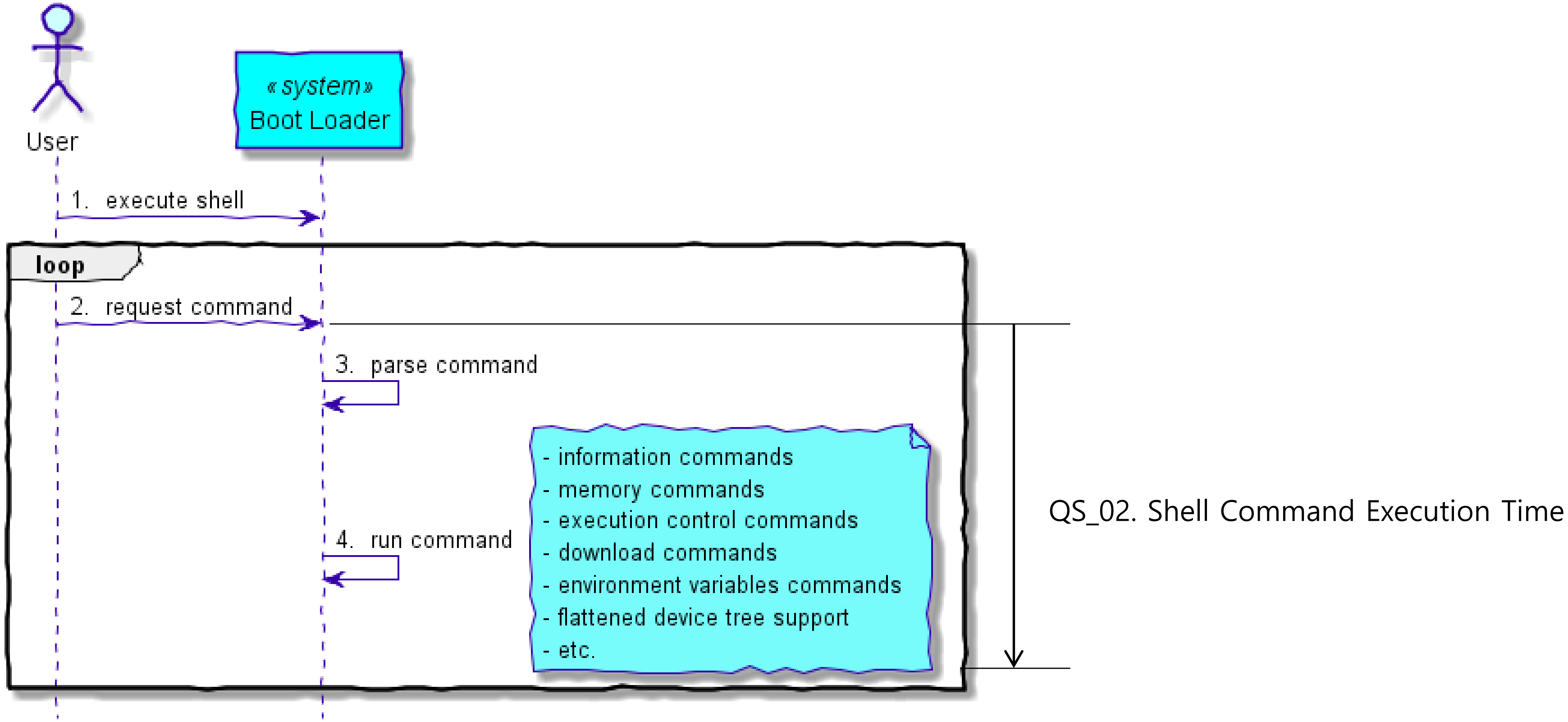
Performance

Response Time

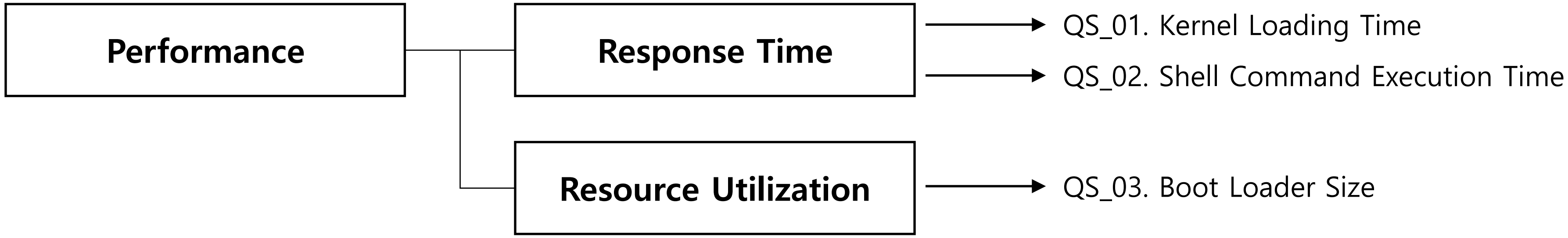
Resource Utilization

QS_01. Kernel Loading Time

QS_02. Shell Command Execution Time



활동4. 품질 시나리오 생성



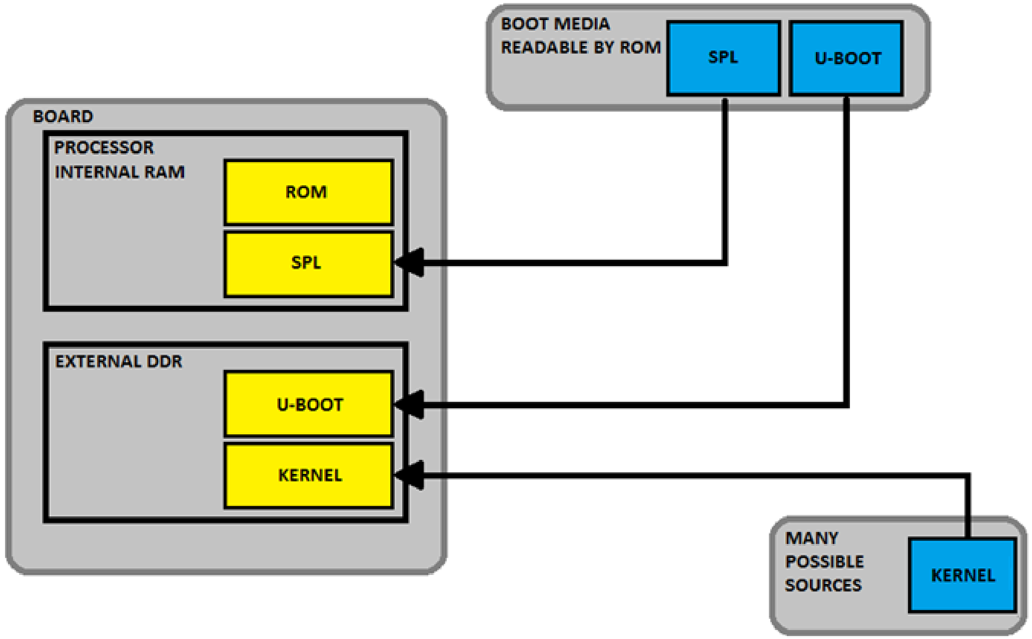
Performance

Response Time

- QS_01. Kernel Loading Time
- QS_02. Shell Command Execution Time

Resource Utilization

- QS_03. Boot Loader Size

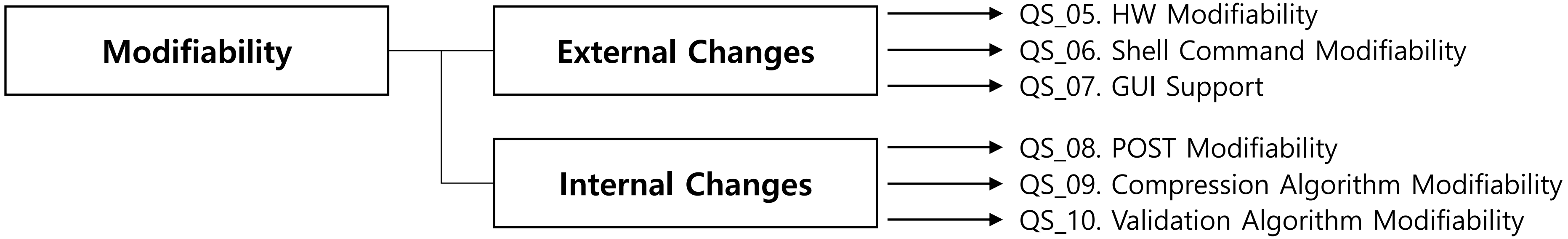


QS_03. Boot Loader Size should be less than on-chip RAM size.

Constraint_01. CPU on-chip RAM or Boot Media size

➔ OS_04. CPU on-chip RAM Size Modifiability

활동4. 품질 시나리오 생성



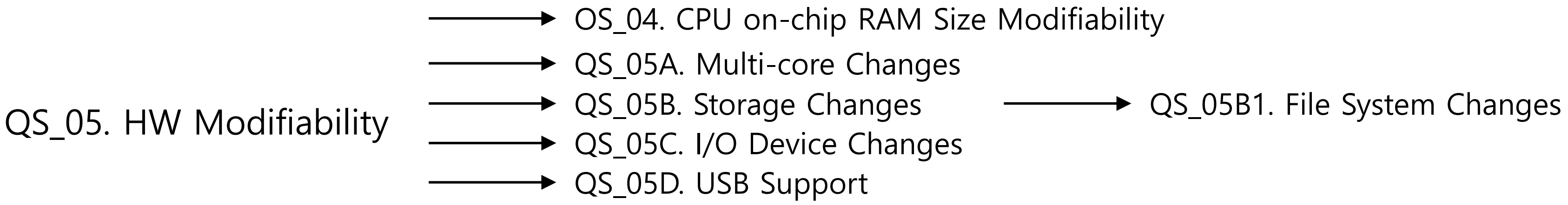
Modifiability

External Changes

- QS_05. HW Modifiability
- QS_06. Shell Command Modifiability
- QS_07. GUI Support

Internal Changes

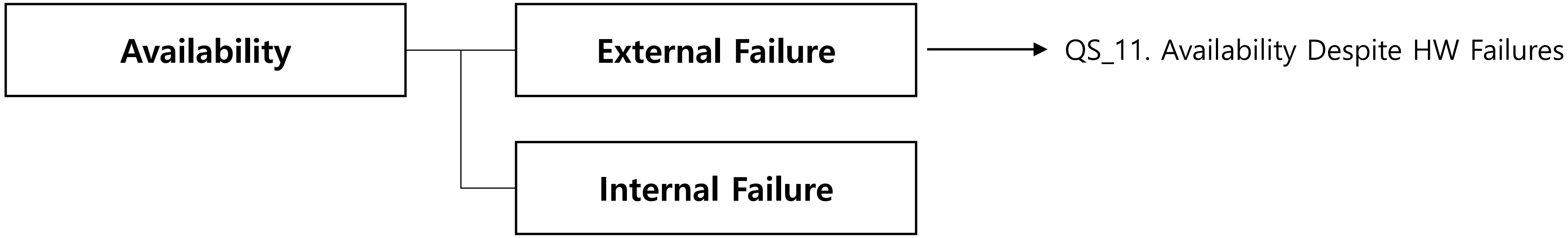
- QS_08. POST Modifiability
- QS_09. Compression Algorithm Modifiability
- QS_10. Validation Algorithm Modifiability



QS_05. HW Modifiability

- OS_04. CPU on-chip RAM Size Modifiability
- QS_05A. Multi-core Changes
- QS_05B. Storage Changes
  - QS_05B1. File System Changes
- QS_05C. I/O Device Changes
- QS_05D. USB Support

활동4. 품질 시나리오 생성



Availability

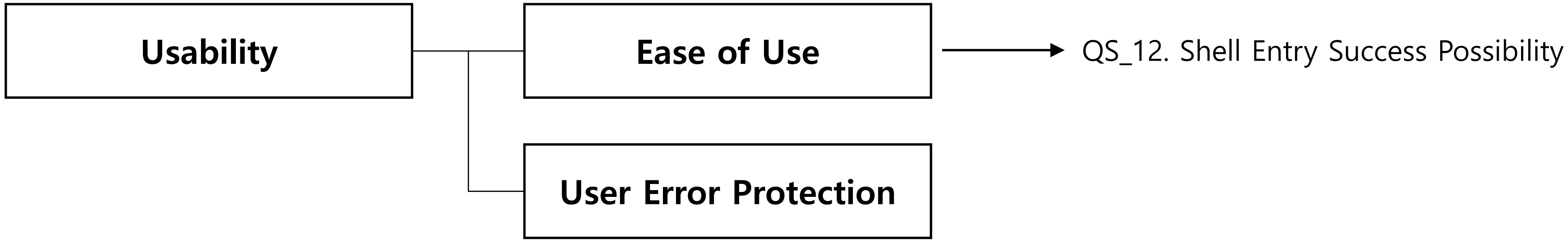
External Failure

Internal Failure

→ QS_11. Availability Despite HW Failures

QS_11. Availability Despite HW Failures → QS_11A. Availability Despite Storage Failures

활동4. 품질 시나리오 생성

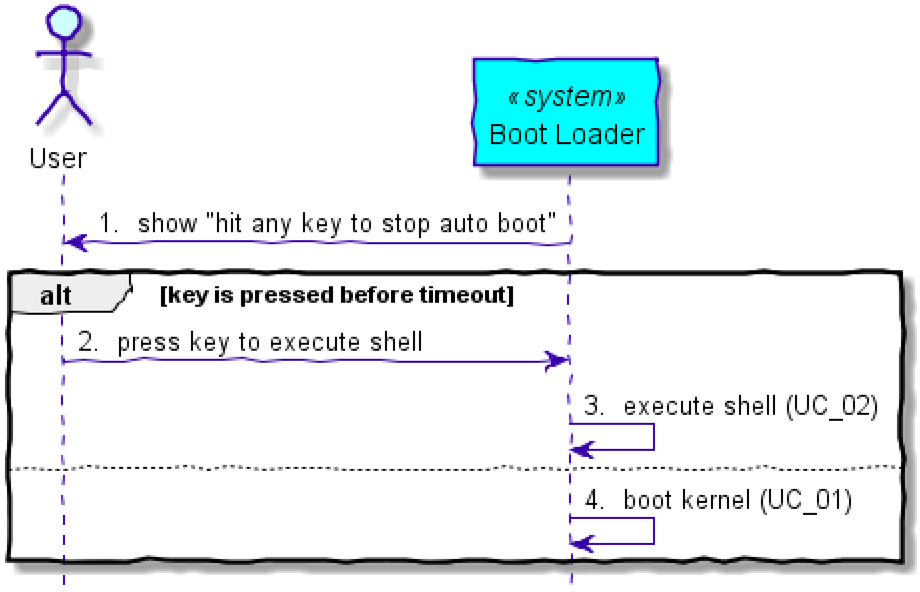


Usability

Ease of Use

User Error Protection

QS_12. Shell Entry Success Possibility

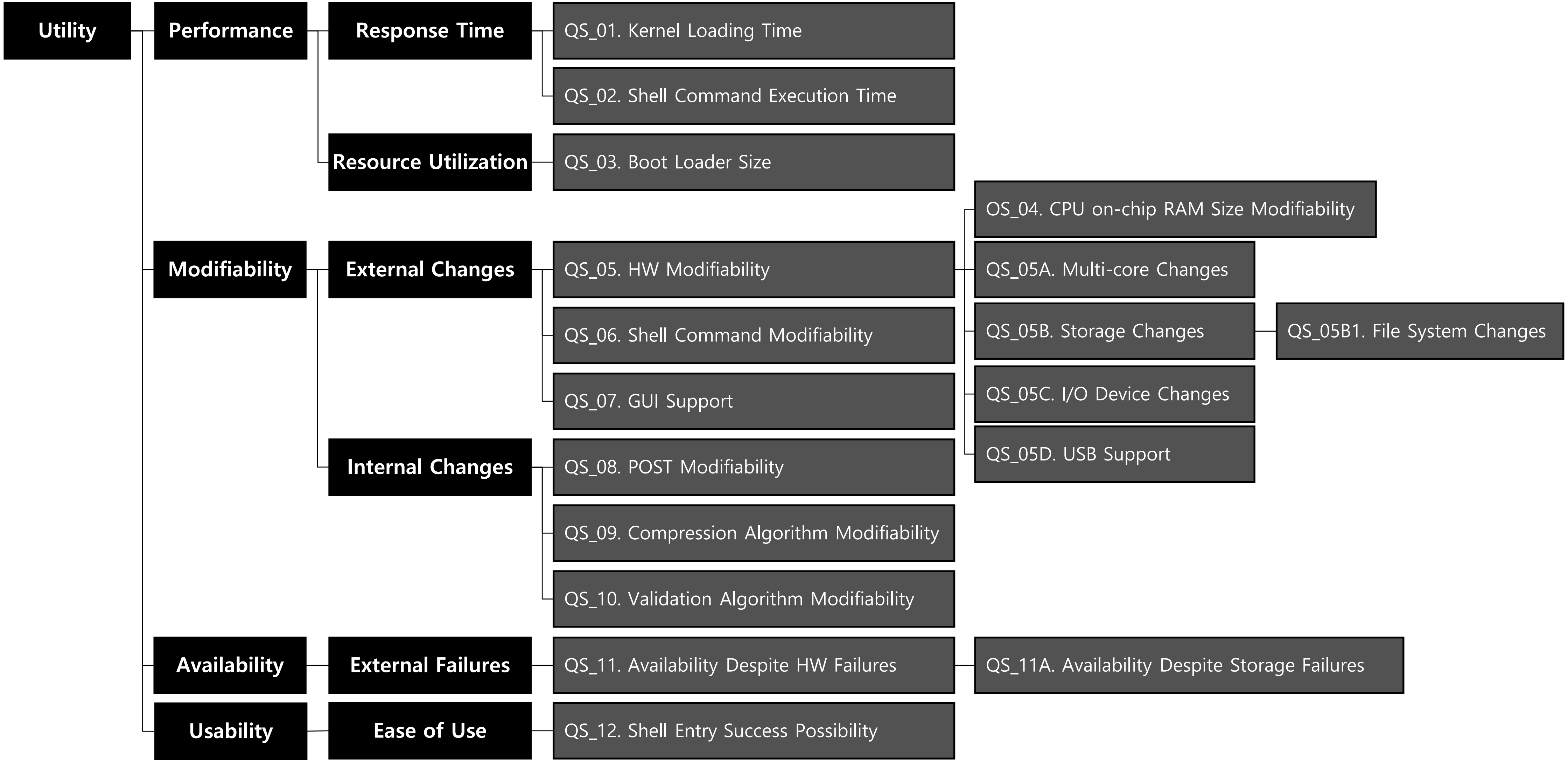

User
«system»
Boot Loader
1. show "hit any key to stop auto boot"
alt
[key is pressed before timeout]
2. press key to execute shell
3. execute shell (UC_02)
4. boot kernel (UC_01)

Timeout delays booting kernel(QS_01).

Too short timeout reduces shell entry success possibility(QS_12).

➔ Design for concurrent execution is required.

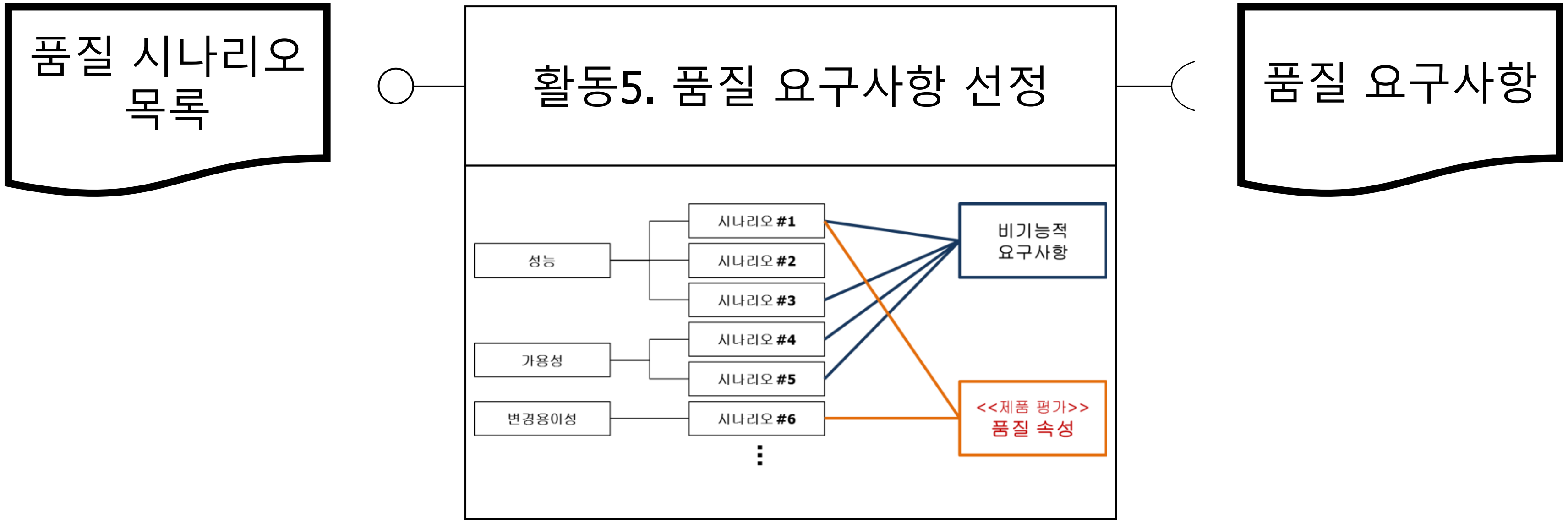
활동4. 품질 시나리오 생성



- Utility
  - Performance
    - Response Time
      - QS_01. Kernel Loading Time
      - QS_02. Shell Command Execution Time
    - Resource Utilization
      - QS_03. Boot Loader Size
  - Modifiability
    - External Changes
      - QS_05. HW Modifiability
        - OS_04. CPU on-chip RAM Size Modifiability
        - QS_05A. Multi-core Changes
        - QS_05B. Storage Changes
          - QS_05B1. File System Changes
        - QS_05C. I/O Device Changes
        - QS_05D. USB Support
      - QS_06. Shell Command Modifiability
      - QS_07. GUI Support
    - Internal Changes
      - QS_08. POST Modifiability
      - QS_09. Compression Algorithm Modifiability
      - QS_10. Validation Algorithm Modifiability
  - Availability
    - External Failures
      - QS_11. Availability Despite HW Failures
        - QS_11A. Availability Despite Storage Failures
  - Usability
    - Ease of Use
      - QS_12. Shell Entry Success Possibility

활동5. 품질 요구사항 선정

목적	품질 시나리오의 중요도 분석을 통해, 품질 요구사항(비기능적 요구사항과 품질 속성)을 선정한다.



품질 시나리오 목록

활동5. 품질 요구사항 선정

품질 요구사항

활동5. 품질 요구사항 선정

Category	Quality Scenario	IM	DI
Performance	QS_01. Kernel Loading Time	H	H
	QS_02. Shell Command Execution Time	M	M
	QS_03. Boot Loader Size	H	L
Modifiability	OS_04. CPU on-chip RAM Size Modifiability	H	H
	QS_05. HW Modifiability	H	L
	QS_05A. Multi-core Changes	H	H
	QS_05B. Storage Changes	H	H
	QS_05B1. File System Changes	M	M
	QS_05C. I/O Device Changes	H	M
	QS_05D. USB Support	L	M
	QS_06. Shell Command Modifiability	M	M
	QS_07. GUI Support	L	M
	QS_08. POST Modifiability	M	L
	QS_09. Compression Algorithm Modifiability	M	L
	QS_10. Validation Algorithm Modifiability	M	L
Availability	QS_11. Availability Despite HW Failures	H	M
	QS_11A. Availability Despite Storage Failures	H	L
Usability	QS_12. Shell Entry Success Possibility	H	L

활동5. 품질 요구사항 선정

Category	Quality Scenario	IM	DI	Quality Requirement
Performance	QS_01. Kernel Loading Time	H	H	QA_01. Kernel Loading Time
	QS_02. Shell Command Execution Time	M	M	QA_06. Shell Command Execution Time NFR_01. Show Info Command Execution Time
	QS_03. Boot Loader Size	H	L	QA_01. Kernel Loading Time
Modifiability	OS_04. CPU on-chip RAM Size Modifiability	H	H	OA_03. CPU on-chip RAM Size Modifiability
	QS_05. HW Modifiability	H	L	QA_05. HW Modifiability
	QS_05A. Multi-core Changes	H	H	QA_02. Multi-core Changes
	QS_05B. Storage Changes	H	H	QA_04. Storage Changes
	QS_05B1. File System Changes	M	M	QA_04. Storage Changes
	QS_05C. I/O Device Changes	H	M	QA_05. HW Modifiability
	QS_05D. USB Support	L	M	-
	QS_06. Shell Command Modifiability	M	M	QA_07. Shell Command Modifiability
	QS_07. GUI Support	L	M	-
	QS_08. POST Modifiability	M	L	QA_08. POST Modifiability
	QS_09. Compression Algorithm Modifiability	M	L	QA_09. Compression Algorithm Modifiability
	QS_10. Validation Algorithm Modifiability	M	L	QA_10. Validation Algorithm Modifiability
Availability	QS_11. Availability Despite HW Failures	H	M	NFR_02. Availability Despite HW Failures
	QS_11A. Availability Despite Storage Failures	H	L	NFR_02. Availability Despite HW Failures
Usability	QS_12. Shell Entry Success Possibility	H	L	NFR_03. Shell Entry Success Possibility

활동5. 품질 요구사항 선정

	Importance	Difficulty	Quality Requirement
QS_01	H	H	High-priority Quality Attribute
QS_02	H	L	Non-functional Requirement
QS_03	L	H	Low-priority Quality Attribute
QS_04	L	L	-

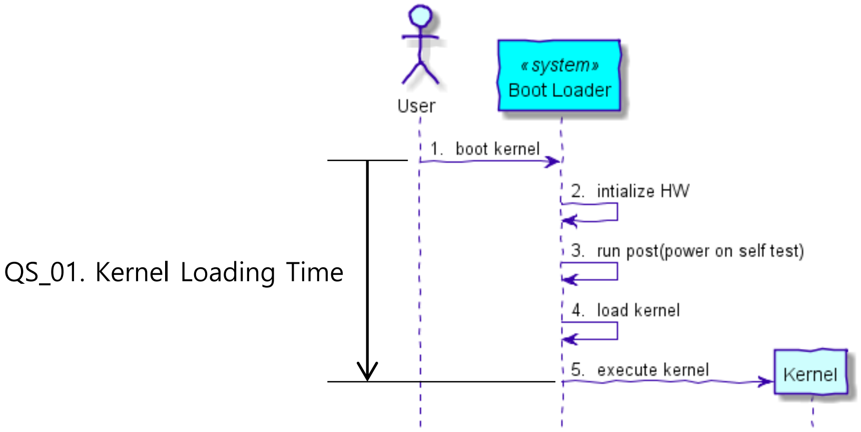
General Guidelines, but …

- It's not enough to determine quality requirements based on only importance and complexity (difficulty).
- The more significant quality attributes should be aligned to the business driver.
- Consensus with stakeholders is required.
- Quality attributes should be ordered in priority.
- The reason why NRFs and QAs are selected and why scenarios are ignored should be explained for readers.

활동5. 품질 요구사항 선정 ➔ 명세

QA_01(QS_01)	Performance	Kernel Loading Time
Description	The less loading time and executing kernel is the better.	
Environment	In the power off state	
Stimulus	1. User requests system to boot kernel.	
Response	1. System initializes HW. 2. System runs POST. 3. System loads kernel. 4. System executes kernel.	
Measurement	[Kernel Loading Time] = [Time to execute kernel] – [Time for user to request to boot kernel]	

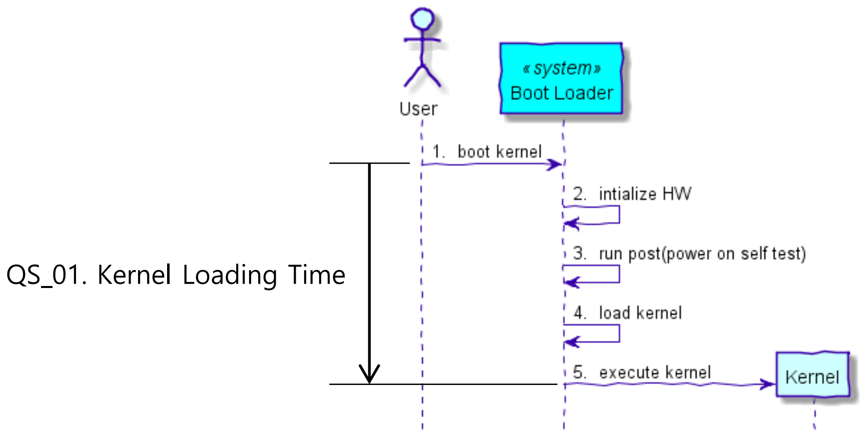
UC_01. Boot Kernel

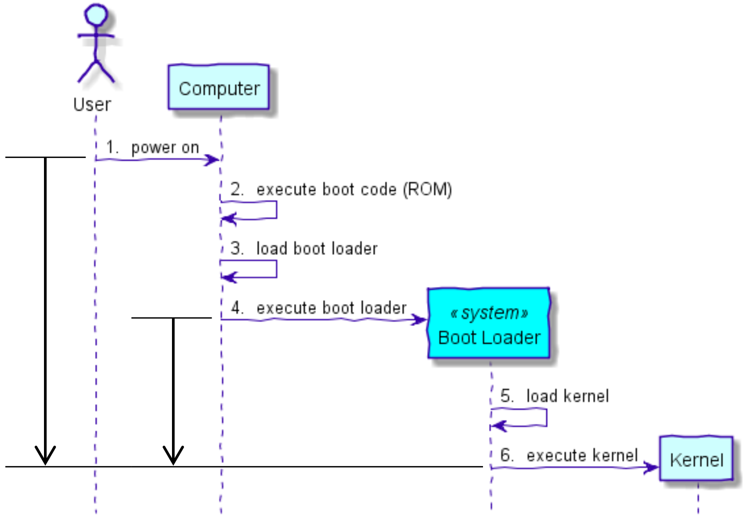


활동5. 품질 요구사항 선정 ➔ 명세

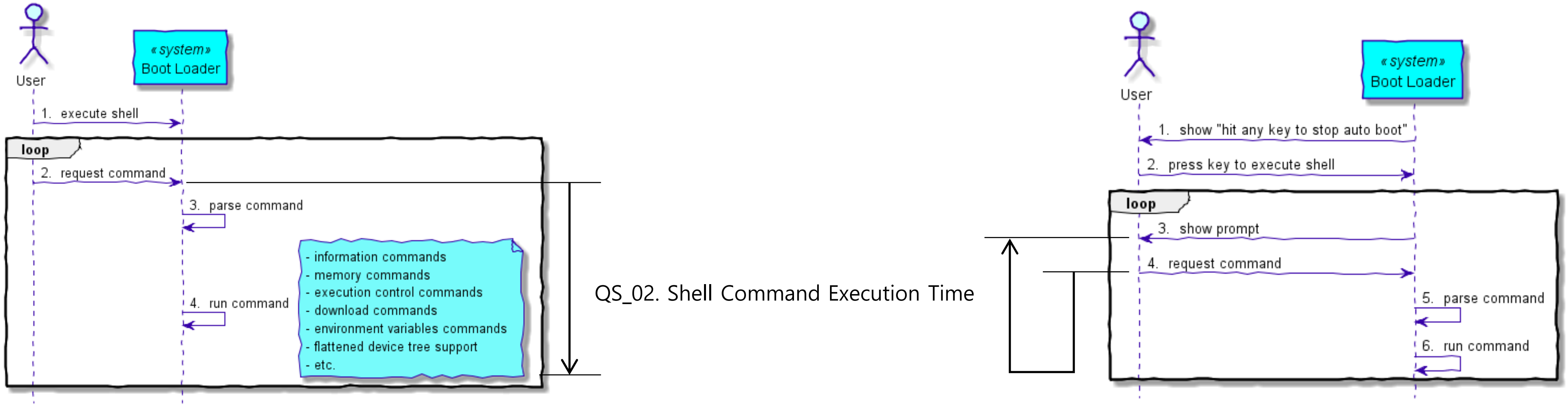
QA_01(QS_01)	Performance	Kernel Loading Time
Description	The less loading time and executing kernel is the better.	
Environment	In the power off state	
Stimulus	1. User turns power on. 2. CPU loads and executes system (boot loader).	
Response	1. System initializes HW. ~~2. System runs POST.~~ 2. System loads kernel. 3. System executes kernel.	
Measurement	[Kernel Loading Time] = [Time to execute kernel] – [Time for user to turn power on]	

UC_01. Boot Kernel



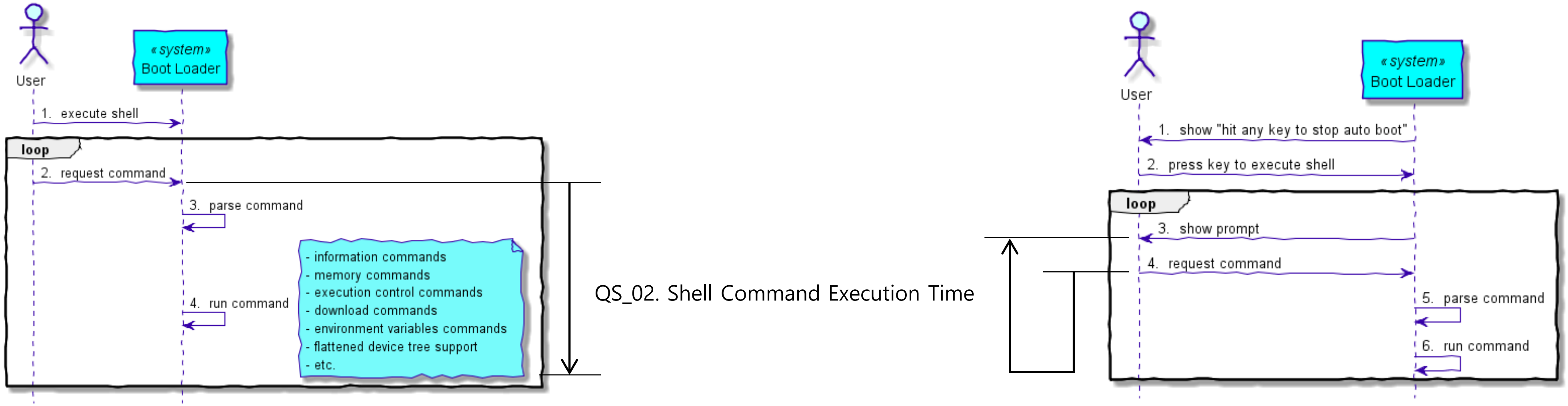


활동5. 품질 요구사항 선정 ➔ 명세



QA_05(QS_02)	Performance	Shell Command Execution Time
Description	The less shell command execution time is the better.	
Environment	In the shell entry state	
Stimulus	1. System shows prompt to user. 2. User requests system with command.	
Response	1. System completes to execute the requested command. 2. System shows prompt to user.	
Measurement	[Command Execution Time] = [Time to show prompt] – [Time for user to request command]	

활동5. 품질 요구사항 선정 ➔ 명세



NFR_01(QS_02)	Performance	Show Info Command Execution Time
Description	The less shell command execution time is the better.	
Environment	In the shell entry state	
Stimulus	1. System shows prompt to user. 2. User requests system with command – show info.	
Response	1. System completes to execute the requested command. 2. System shows prompt to user.	
Measurement	[Command Execution Time] = [Time to show prompt] – [Time for user to request command]	
Allowance	[Command Execution Time] < 1s	

P1. 요구 분석

Develop software that fulfills the **business driver**

⇧ **QAs should be aligned to business driver**

Design **architecture** that optimizes **quality requirements (NFRs, QAs)**

Specify and analyze **functional requirements related to quality requirements** in more detail

ASR (Architecturally Significant Requirements)

When specifying functional requirements,
focus on specifying **what the system needs to do**