

# SATURN 2008 Workshop

## "Architecture Curve, new formatted ATAM report in a single graph"

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### Introduction



#### ● Samsung Electronics Co. Ltd.

- CE (Consumer Electronics) producer : mobile phone, TV, mp3, refrigerator, air conditioner, etc.
- Embedded system, tight lead-time, small team



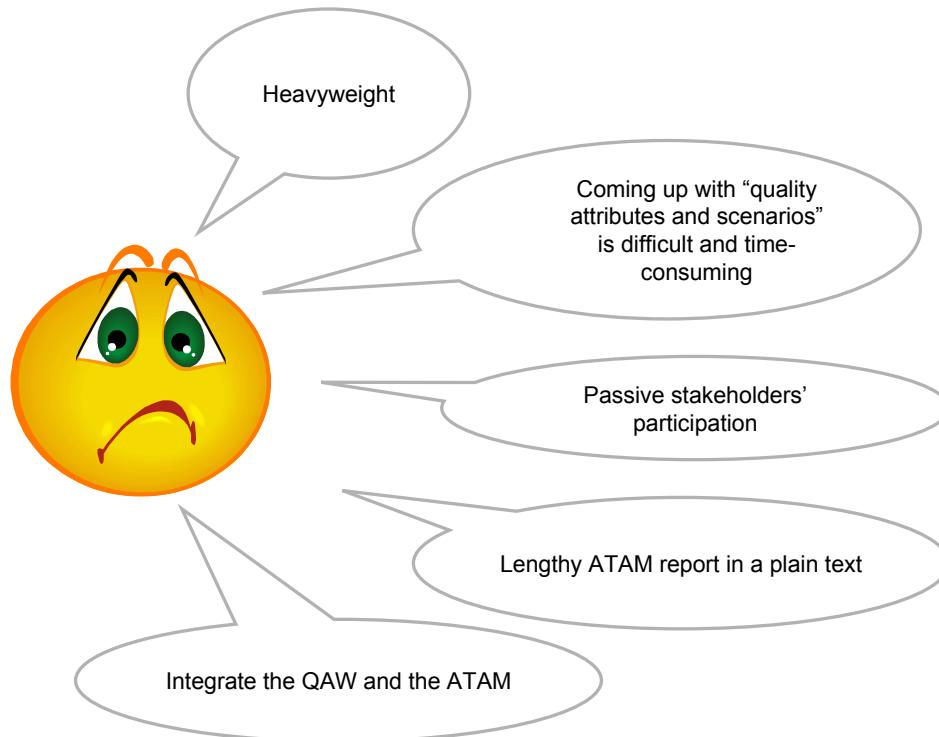
#### ● from 2004 ~

- Architectural Demands Analysis
  - : SEI (Software Engineering Institute) 's **QAW (Quality Attribute Workshop)**
- Architecture Evaluation
  - : SEI's **ATAM (Architecture Tradeoff Analysis Method)**

#### ● The goal of this presentation

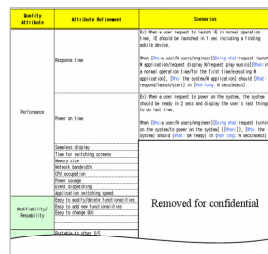
- Describe tailored QAW and ATAM process in Samsung Electronics.
- Introduce an additional ATAM reports shaped in a single graph, "Architecture Curve"





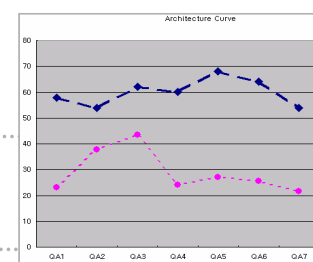
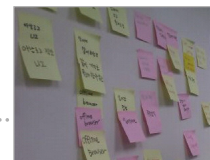
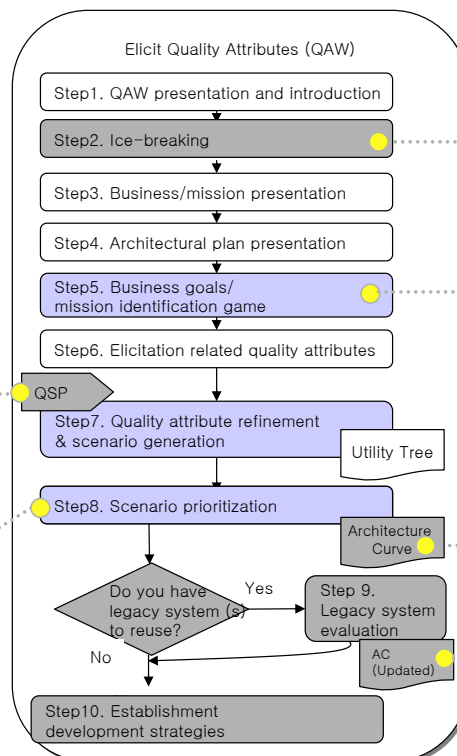
## Tailored QAW in Samsung Elec. (1/3)

- 1) QAW presentation and Introductions
- 2) Business/Programmatic presentation
- 3) Architectural plan presentation
- 4) Identification of Architectural Drivers
- 5) Scenario Brainstorming
- 6) Scenario Consolidation
- 7) Scenario Prioritization
- 8) Scenario Refinement

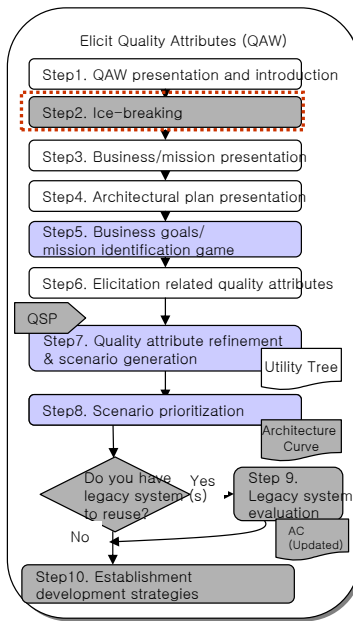


Newly Introduced step

Changed step



## Step 2. Adopt "Ice-breaking Activity"

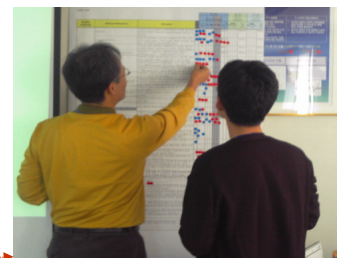
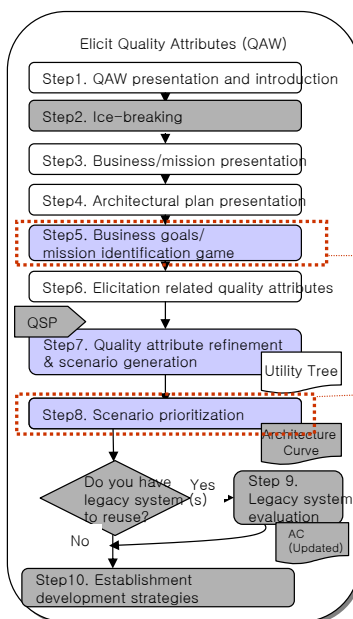


- GE's work-out techniques
- Samsung Elec./ VIP center/ CPS (Creative Problem Solving)
- "Untie human chains", "Work-out puzzle", "Self Introduction", etc.



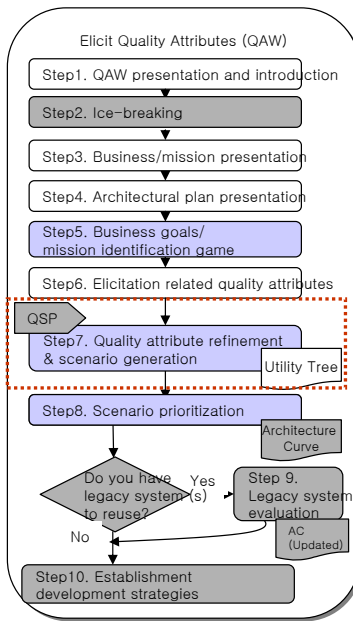
Benefits	Demerits
<ul style="list-style-type: none"> <li>• Helped to start the workshop in concord with 10 ~ 15 minutes investment</li> <li>• Friendly atmosphere naturally drives active discussion and engagement</li> </ul>	<ul style="list-style-type: none"> <li>• Possible to be distracted</li> </ul>

## Step 5./Step 8. Utilize "Post-it & Sticker"



Benefits	Demerits
<ul style="list-style-type: none"> <li>• Elicited a variety of opinions</li> <li>• Minimize the influence of others' opinion</li> <li>• Animate the air through moving body slightly</li> <li>• Easy to group/consolidate/remove visually</li> </ul>	<ul style="list-style-type: none"> <li>• Possible to be distracted</li> </ul>

## Step 7. Quality Scenario Pool (QSP) (1/2)

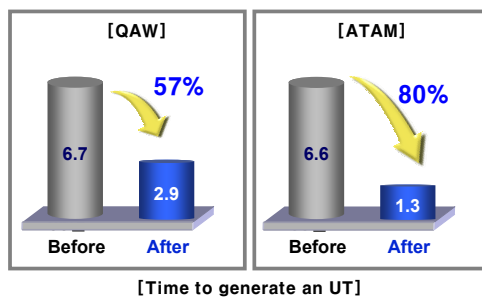


Quality Attribute	Attribute Refinement	Scenarios
Performance	Response time	Ex) When a user request to launch IE in normal operation time, IE should be launched in 1 sec including a finding mobile device.  When [Who: a user/N users/engineer][Doing what: request launch M application/request display N/request play musics][When: in a normal operation time/for the first time/executing M application], [Who: the system/M application] should [What: respond/launch/start] in [How long: N secs/msecs]
	Power on time	Ex) When a user request to power on the system, the system should be ready in 2 secs and display the user's last things to do last time.  When [Who: a user/N users/engineer][Doing what: request turning on the system/to power on the system] ([When:]), [Who: the system] should [What: be ready] in [How long: N secs/msecs]
Modifiability/Resubility	Seamless display	<ul style="list-style-type: none"> <li>o Gathering of                             <ul style="list-style-type: none"> <li>- Prospective Quality Attributes</li> <li>- Attribute Refinements</li> <li>- Scenarios</li> </ul> </li> <li>o Each Scenario has                             <ul style="list-style-type: none"> <li>- Sample Scenarios</li> <li>- Scenario Template</li> </ul> </li> </ul>
	Time for switching screens	
	Memory size	
	Network bandwidth	
	CPU occupation	
	Power usage	
	Event dispatching	
	Application switching speed	
	Easy to modify/delete functionalities	
	Easy to add new functionalities	
	Easy to change GUI	
	Portable to other O/S	

## Step 7. Quality Scenario Pool (QSP) (2/2)

### Benefits

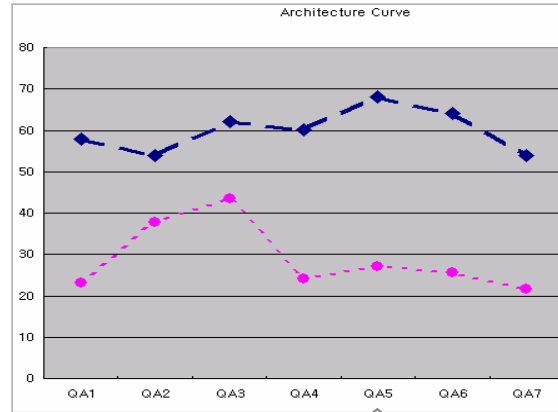
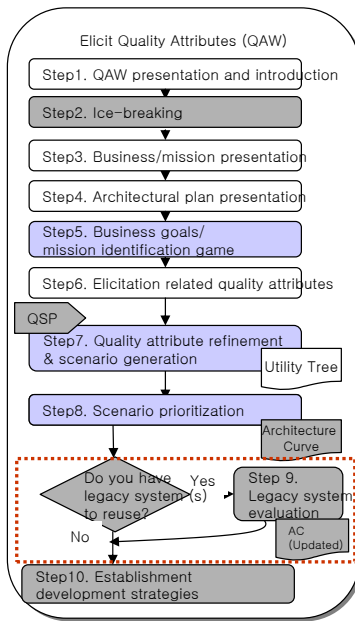
- o Improving quality of generated quality scenarios
- o Elevating stakeholders' participation
- o Shortening the time of "generating an utility tree"



### Demerits

- o "The quality of utility tree" depends on "the quality of QSP"
- o Should maintain the QSP as changes of Tech & Trend changes

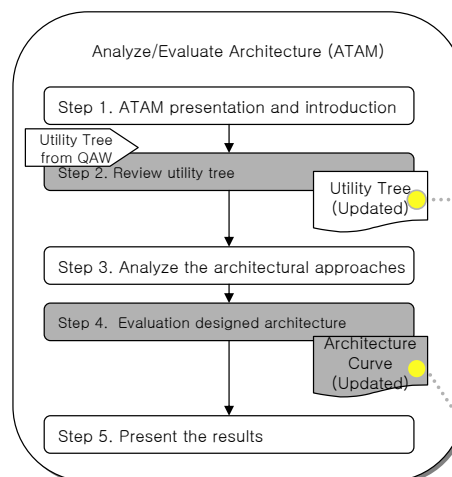
## Step 9. Architecture Curve (AC)



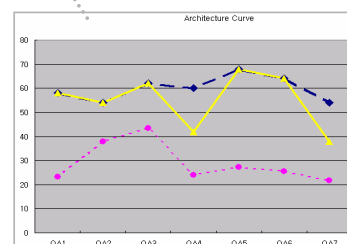
Quality Attribute	Attribute Refinement	Scenario
Response time		When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
Performance	Power on time	When a user request to power on the system, the system should be ready in 2 sec and display the user's last things on last time.
	Screenless display	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	Time for switching screens	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	Memory size	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	Network bandwidth	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	CPU occupied rate	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	Power usage	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	Event distribution	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	Real-time monitoring speed	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	Easy to modify/delete function content	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	Easy to add new function content	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
	Easy to change GUI	When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.
Modifiability/Residuality		When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.

## Tailored ATAM in Samsung Elec. (1/3)

- 1) Present the ATAM
- 2) Present business drivers
- 3) Present architecture
- 4) Identify architectural approaches
- 5) Generate quality attribute utility tree
- 6) Analyze architectural approaches
- 7) Brainstorm and prioritize scenarios
- 8) Analyze architectural approaches
- 9) Present results



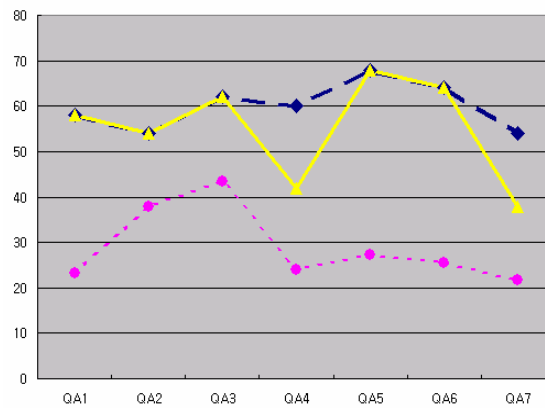
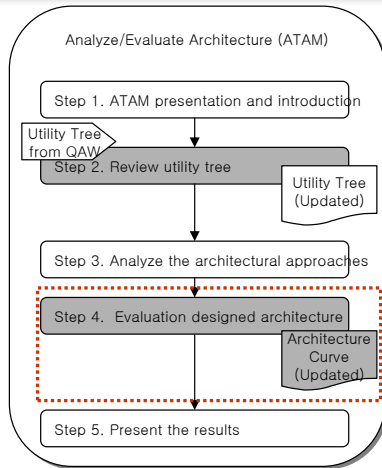
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Modifiability/Residuality		When a user request to launch 12 in normal operation time, it should be launched in 1 sec including a finding table device.



Newly Introduced step



## Step 4. Architecture Curve (1/2)



Quantity	ATAM Status	Summary	Architectural approaches	As-is status (before)	To-be status (after)
Response time	ATAM Status	When a user request is received, the system should respond within 1 sec. including a finding time. It should be less than 1 sec. including a finding time. When the user request is received, the system should respond within 1 sec. including a finding time. When the user request is received, the system should respond within 1 sec. including a finding time.	Architectural approaches	As-is status (before)	To-be status (after)

[Tailored utility tree template]

To-be importance (ideal)	As-is status (before)	To-be status (after)
To-be importance (ideal)	As-is status (before)	To-be status (after)
Architectural approaches	As-is status (before)	To-be status (after)
H: 1	M: 2	L: 2

• X-axis : Selected high-priority scenarios

• Y-axis

-To-be importance (ideal)

: Score of priority value

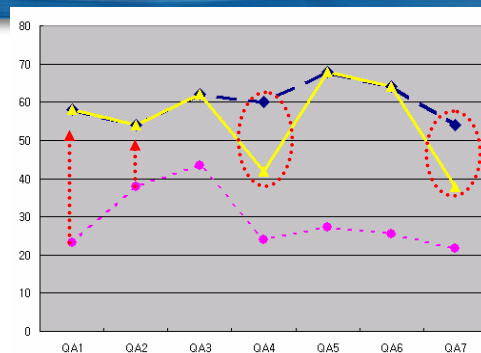
-As-is status (before)

: If Legacy System exists, result of assessment the level of architecture in 4 levels ( H/M1/M2/L )

-To-be status (after)

: Result of evaluation the level of architecture in 4 levels ( H/M1/M2/L )

## Step 4. Architecture Curve (2/2)



◆ To-be importance  
◆ As-is status (Before)  
◆ To-be status (After)

### Benefits

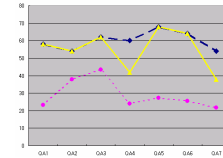
- Easy to understand comparing a plain text
- Straightforward to compare priorities among top scenarios
- Visualize the level of designed architecture
- When there is legacy system,
  - visualize the level of legacy system architecture
  - establish development strategies
  - visualize before & after status
  - where to be improved

### Demerits

- Evaluate the level of designed architecture and legacy system architecture in 4 levels by architects and key developers' subjective engineering judgment

## Visualized ATAM report in a single graph (Architecture Curve)

- (+) Straightforward to understand the level of architecture
- (+) Visualize before & after status
- (-) Depend on architects & key developers' subjective engineering judgment



## Quality Scenario Pool (QSP)

- (+) Shorten the time to generate an utility tree
- (+) Improve the quality of generated quality scenarios
- (-) High-quality of the QSP is a precondition for these

Quality attribute	Utility tree for context	Scenario
Performance	Response time	<p>1. The user is able to respond to requests in a timely manner and the system is able to handle a large number of requests.</p> <p>2. The user is able to respond to requests in a timely manner and the system is able to handle a large number of requests.</p> <p>3. The user is able to respond to requests in a timely manner and the system is able to handle a large number of requests.</p>
Reliability	Uptime	<p>1. The system is able to handle a large number of requests and the system is able to handle a large number of requests.</p> <p>2. The system is able to handle a large number of requests and the system is able to handle a large number of requests.</p> <p>3. The system is able to handle a large number of requests and the system is able to handle a large number of requests.</p>
Availability	Uptime	<p>1. The system is able to handle a large number of requests and the system is able to handle a large number of requests.</p> <p>2. The system is able to handle a large number of requests and the system is able to handle a large number of requests.</p> <p>3. The system is able to handle a large number of requests and the system is able to handle a large number of requests.</p>

## Ice-breaking activity & utilize post-its/stickers

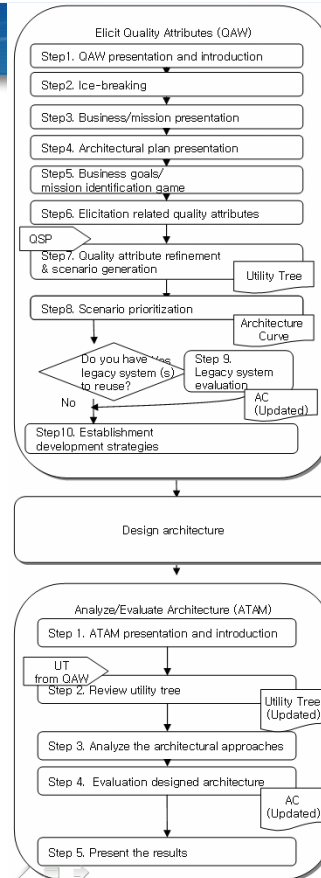
- (+) Friendly atmosphere naturally drives active discussion and participation
- (-) Could be distracted

Comments & Questions

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## QAW + ATAM Integrated process

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Create the Next Wave

- 15/14 -

## Raw data

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### 18 projects

	Before applying the QSP										After applying the QSP							
	QAW			ATAM							QAW				ATAM			
	A	B	C	D	E	F	G	H	I	J	H	I	J	K	H	I	J	K
# of generated scenarios	30	17	19	20	21	21	19	24	22	22	18	21	22	24	18	21	22	24
Time to generate a utility tree (hrs)	7	7	6	6.5	6	7	6.5	7	6.5	7	2.5	3	3	3	1.5	1	1.5	1
Time to generate a utility tree on average (hrs)	6.67			6.64							2.88				1.25			
Total workshop execution time (hrs)	8.5	7.5	8	16	16	15	17	16	16	16	4	4.5	4.5	4	11	12	12	12
Total workshop execution time on average (hrs)	8			15.93							4.25				11.5			

Create the Next Wave

- 16/14 -