

# Introduction to System Performance Design

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## Abstract

What is System Performance? Why should a software engineer have knowledge of the other parts of the system, such as the Hardware, the Operating System and the Middleware? The applications that he/she writes are self-contained, so how can other parts have any influence? This introduction sketches the problem and shows that at least a high level understanding of the system is very useful in order to get optimal performance.

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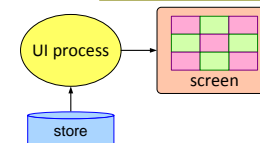
June 5, 2018

status: preliminary  
draft

version: 0.5

What If....

```
Sample application code:  
for x = 1 to 3 {  
  for y = 1 to 3 {  
    retrieve_image(x,y)  
  }  
}
```



*content of this presentation*

Example of problem

Problem statements

# Image Retrieval Performance

application need:

at event 3\*3 show 3\*3 images  
instantaneous

design

design

Sample application code:

```
for x = 1 to 3 {  
  for y = 1 to 3 {  
    retrieve_image(x,y)  
  }  
}
```

or

alternative application code:

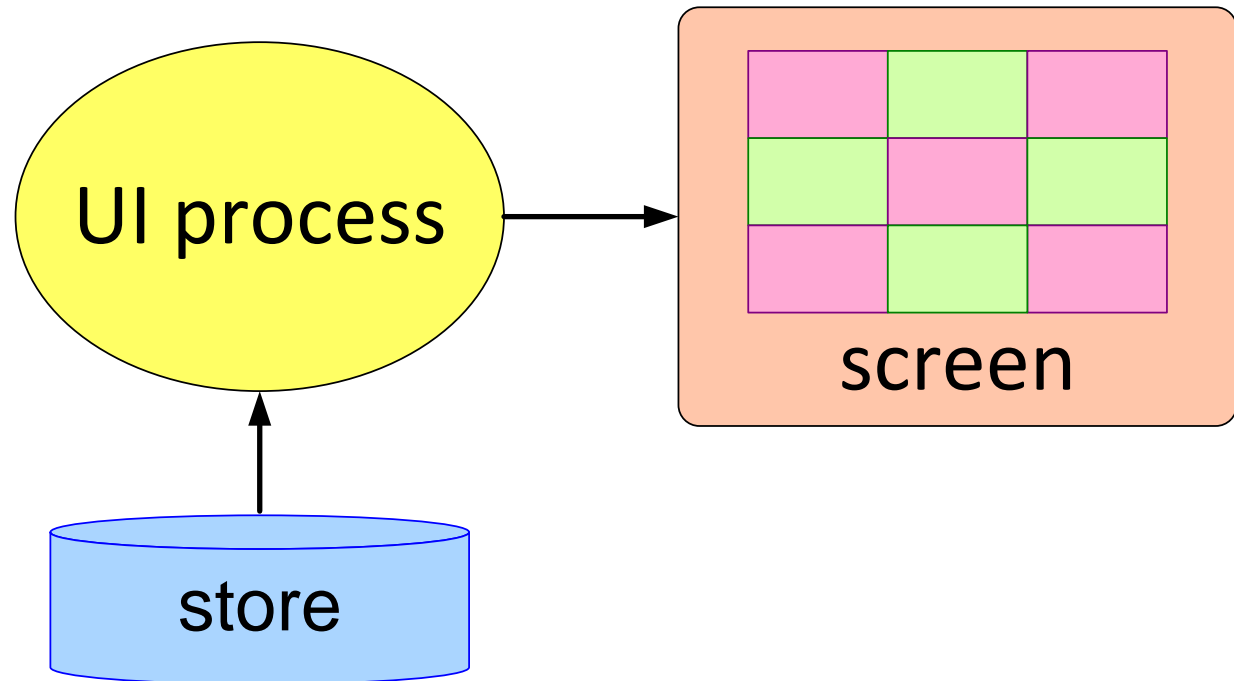
event 3\*3 -> show screen 3\*3

```
<screen 3*3>  
  <row 1>  
    <col 1><image 1,1></col 1>  
    <col 2><image 1,2></col 2>  
    <col 3><image 1,3></col 3>  
  </row 1>  
  <row 2>  
    <col 1><image 1,1></col 1>  
    <col 2><image 1,2></col 2>  
    <col 3><image 1,3></col 3>  
  </row 1>  
  <row 2>  
    <col 1><image 1,1></col 1>  
    <col 2><image 1,2></col 2>  
    <col 3><image 1,3></col 3>  
  </row 3>  
</screen 3*3>
```

## What If.....

Sample application code:

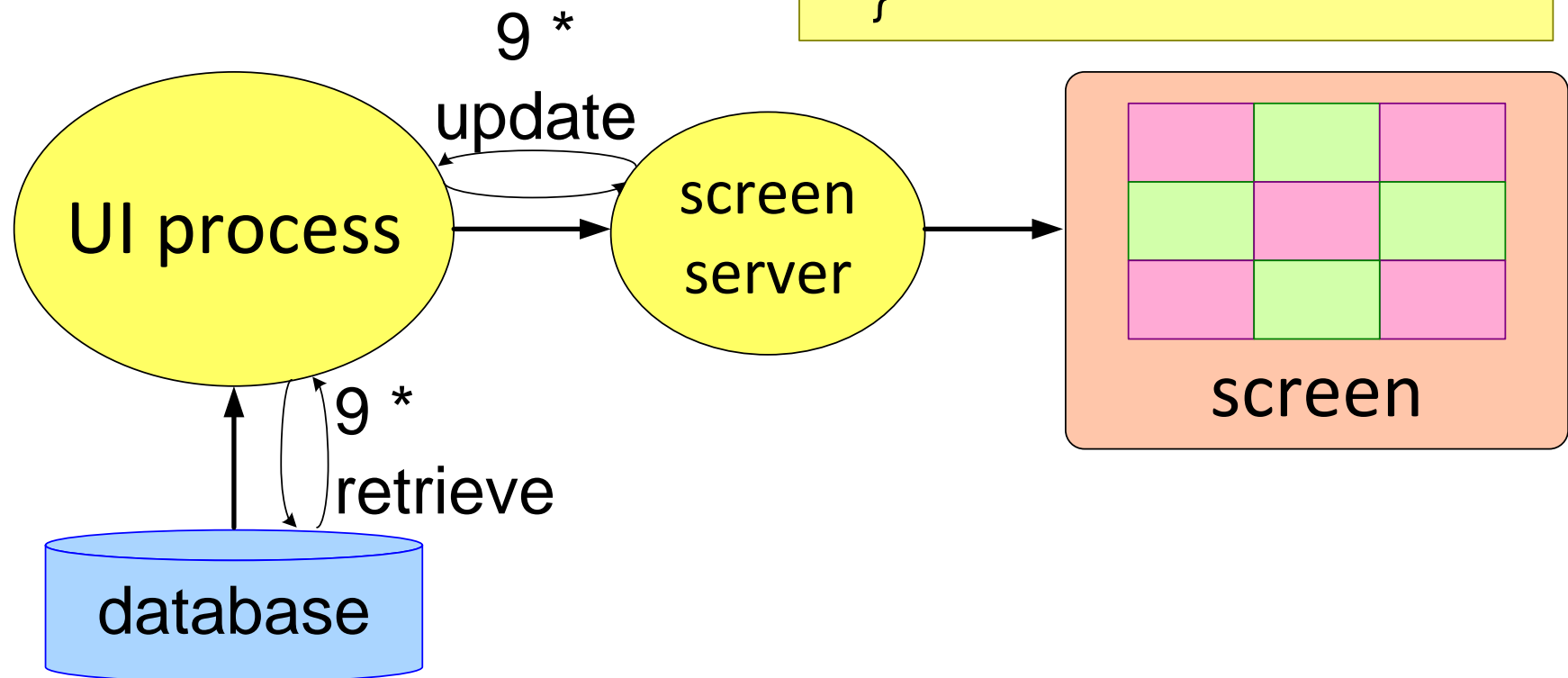
```
for x = 1 to 3 {  
  for y = 1 to 3 {  
    retrieve_image(x,y)  
  }  
}
```



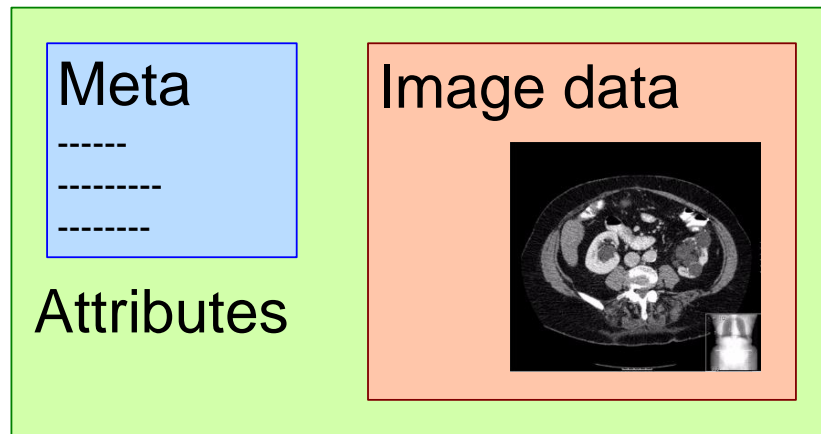
## What If....

Sample application code:

```
for x = 1 to 3 {  
  for y = 1 to 3 {  
    retrieve_image(x,y)  
  }  
}
```



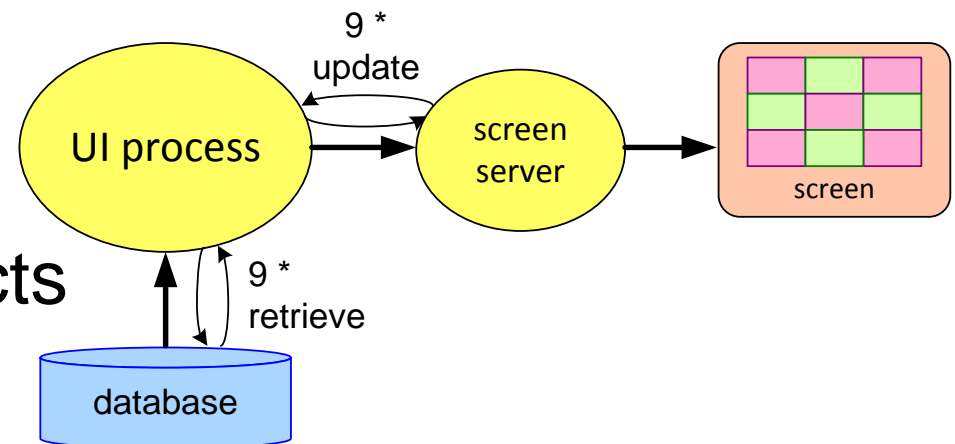
## What If....



Sample application code:

```
for x = 1 to 3 {  
  for y = 1 to 3 {  
    retrieve_image(x,y)  
  }  
}
```

Attribute = 1 COM object  
100 attributes / image  
9 images = 900 COM objects  
1 COM object = 80 $\mu$ s  
9 images = 72 ms



## What If....

Sample application code:

```
for x = 1 to 3 {  
  for y = 1 to 3 {  
    retrieve_image(x,y)  
  }  
}
```

- I/O on line basis ( $512^2$  image)

$$9 * 512 * t_{I/O}$$

$$t_{I/O} \approx 1ms$$

- . . .

# Non Functional Requirements Require System View

Sample application code:

```
for x = 1 to 3 {  
  for y = 1 to 3 {  
    retrieve_image(x,y)  
  }  
}
```

can be:

fast, but very local  
slow, but very generic  
slow, but very robust  
fast and robust

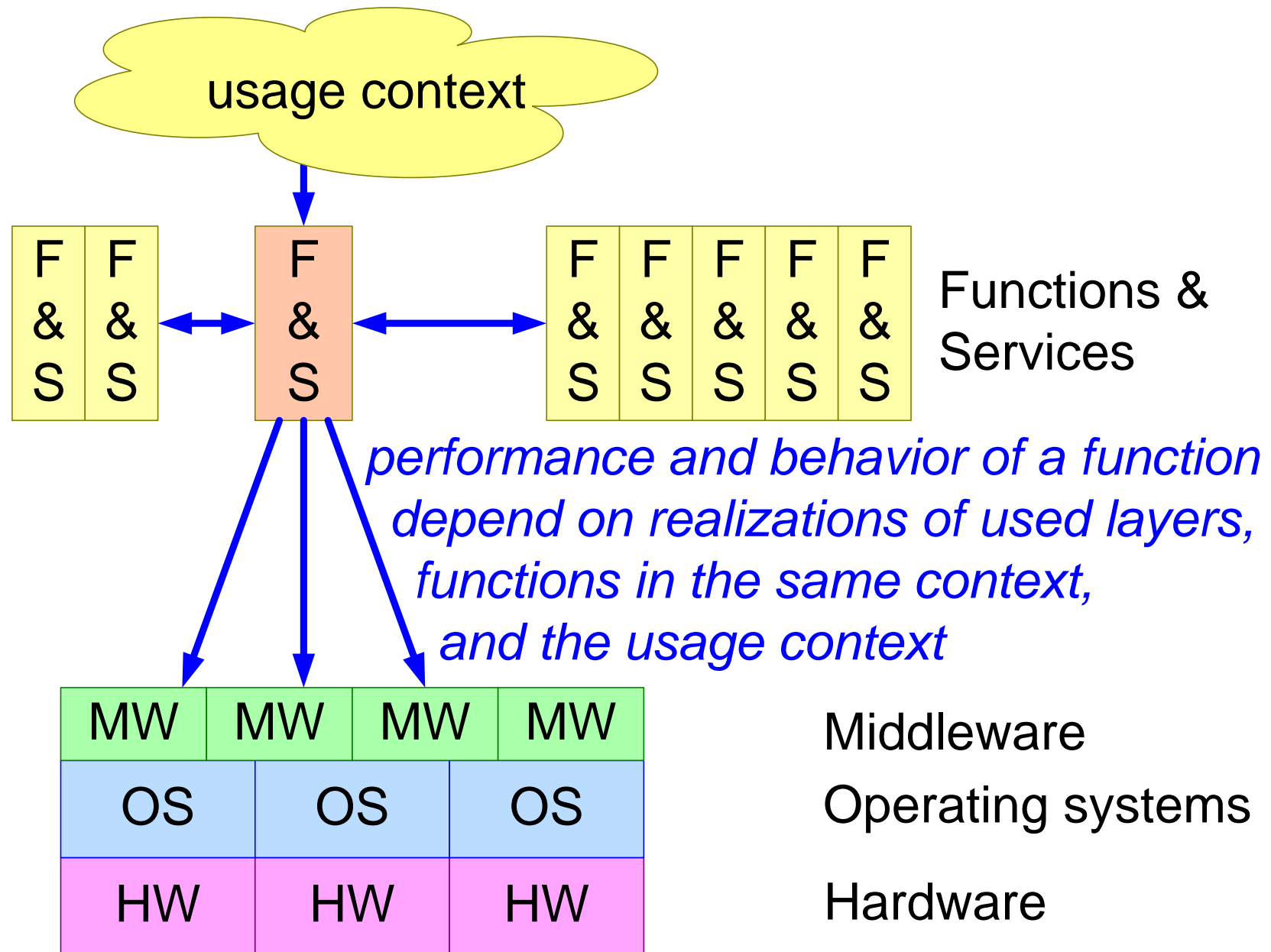
...

*The emerging properties (behavior, performance) cannot be seen from the code itself!*

*Underlying platform and neighbouring functions determine emerging properties mostly.*



# Function in System Context



# Challenge

F	F	F	F	F	F	F	F
&	&	&	&	&	&	&	&
S	S	S	S	S	S	S	S
MW		MW		MW		MW	
OS		OS		OS			
HW		HW		HW			

Functions & Services

Middleware

Operating systems

Hardware

Performance = Function (F&S, other F&S, MW, OS, HW)

MW, OS, HW  $\gg$  100 Manyear : very complex

Challenge: How to understand MW, OS, HW  
with only a few parameters

## *Summary of Introduction to Problem*

Resulting System Characteristics cannot be deduced from local code.

Underlying platform, neighboring applications and user context:

have a big impact on system characteristics

are big and complex

Models require decomposition, relations and representations to analyse.

The ASP™ course is partially derived from the EXARCH course developed at *Philips CTT* by *Ton Kostelijk* and *Gerrit Muller*.

Extensions and additional slides have been developed at *ESI* by *Teun Hendriks*, *Roland Mathijssen* and *Gerrit Muller*.