IAIK

TU Graz

SCIENCE
PASSION
TECHNOLOGY

Draw.io2TikZ

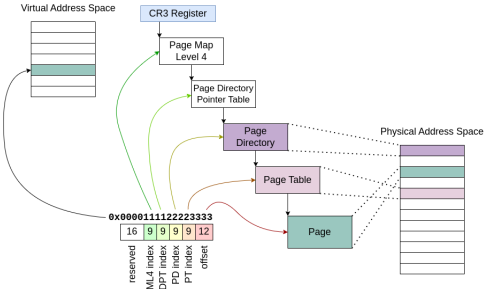
Arthur Lippitz

Bachelor Thesis 2024

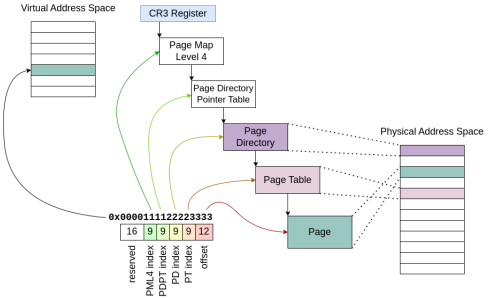
Draw.io

draw.io

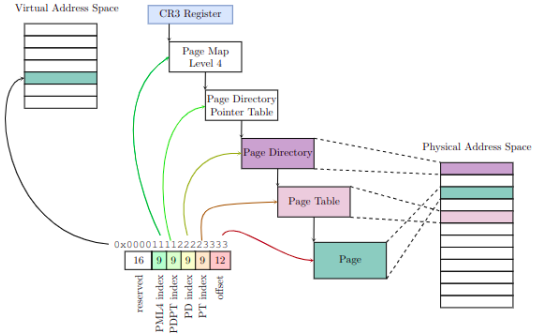
Draw.io


Virtual Address Space
CR3 Register
Page Map Level 4
Page Directory Pointer Table
Page Directory
Page Table
Page
Physical Address Space
0x0000111122223333
16
9
9
9
9
12
reserved
PML4 index
PDPT index
PD index
PT index
offset

Draw.io




```
▼<mxCell id="hbQlXQG8O_coOShvYq_x-26" value="Virtual Address Space"
 style="text;html=1;strokeColor=none;fillColor=none;align=center;verticalAlign=middle;whiteSpace=wrap;rounded=0;fontSize=18;"
 parent="1" vertex="1">
   <mxGeometry x="-80" width="200" height="30" as="geometry"/>
 </mxCell>
▼<mxCell id="hbQlXQG8O_coOShvYq_x-27" value="Physical Address Space"
 style="text;html=1;strokeColor=none;fillColor=none;align=center;verticalAlign=middle;whiteSpace=wrap;rounded=0;fontSize=18;"
 parent="1" vertex="1">
   <mxGeometry x="600" y="230" width="200" height="30" as="geometry"/>
 </mxCell>
▼<mxCell id="hbQlXQG8O_coOShvYq_x-36" value="<div><font face="Courier New">0x0000111122223333</font></div>"
 style="text;html=1;strokeColor=none;fillColor=none;align=center;verticalAlign=middle;whiteSpace=wrap;rounded=0;fontSize=18;fontStyle=1"
 parent="1" vertex="1">
   <mxGeometry x="90" y="390" width="205" height="30" as="geometry"/>
 </mxCell>
```


Virtual Address Space
CR3 Register
Page Map Level 4
Page Directory Pointer Table
Page Directory
Page Table
Page
Physical Address Space
0x0000111122223333
16
9
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9
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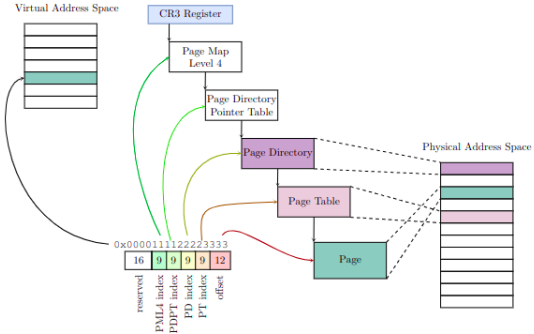


```
89  \node at (25.0, -9.5) [align=center,solid,draw,minimum width=2.4 cm,minimum height=1.0
    cm,text width=2.4cm,inner sep=0](IDq_x-85) {Page Map Level 4};
90  \node at (22.5, -2.5) [align=center,solid,draw=blue,fill=metallicblue,minimum
    width=2.8 cm,minimum height=0.6 cm,text width=2.8cm,inner sep=0](IDg_x-86) {CR3
    Register};
91  \draw [dashed,line width=0.7pt] (IDq_x-17.north east)--(IDYg_x-7.north west);
92  \draw [dashed,line width=0.7pt] (IDq_x-17.south east)--(IDYg_x-8.north west);
```

Problem

Problem

```
<mxCell id="hbQlXQG8O_coOShvYq_x-26" value="Virtual Address Space"
style="text;html=1;strokeColor=none;fillColor=none;align=center;verticalAlign=middle;whiteSpace=wrap;rounded=0;fontSize=18;"
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</mxCell>
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</mxCell>
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parent="1" vertex="1">
  <mxGeometry x="90" y="390" width="205" height="30" as="geometry"/>
</mxCell>
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<mxCell id="hbQlXQG8O_coOShvYq_x-26" value="Virtual Address Space"
style="text;html=1;strokeColor=none;fillColor=none;align=center;verticalAlign=middle;whiteSpace=wrap;rounded=0;fontSize=18;"
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    cm,text width=2.4cm,inner sep=0](IDq_x-85) {Page Map Level 4};
90  \node at (22.5, -2.5) [align=center,solid,draw=blue,fill=metallicblue,minimum
    width=2.8 cm,minimum height=0.6 cm,text width=2.8cm,inner sep=0](IDg_x-86) {CR3
    Register};
91  \draw [dashed,line width=0.7pt] (IDq_x-17.north east)--(IDYg_x-7.north west);
92  \draw [dashed,line width=0.7pt] (IDq_x-17.south east)--(IDYq_x-8.north west);
```
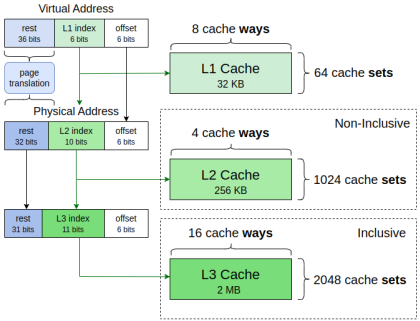
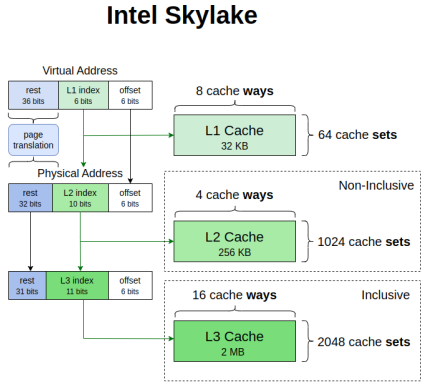
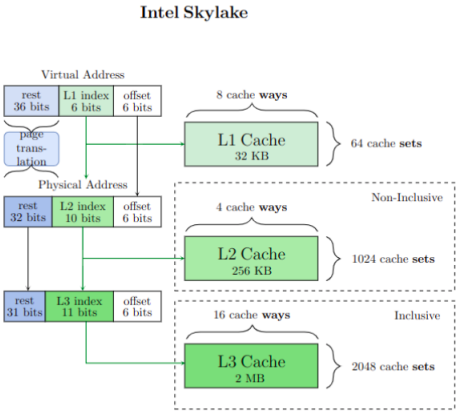

Intel Skylake




Intel Skylake
Virtual Address
rest
36 bits
L1 index
6 bits
offset
6 bits
page translation
Physical Address
rest
32 bits
L2 index
10 bits
offset
6 bits
rest
31 bits
L3 index
11 bits
offset
6 bits
8 cache ways
L1 Cache
32 KB
64 cache sets
Non-Inclusive
4 cache ways
L2 Cache
256 KB
1024 cache sets
16 cache ways
Inclusive
L3 Cache
2 MB
2048 cache sets


Intel Skylake
Virtual Address
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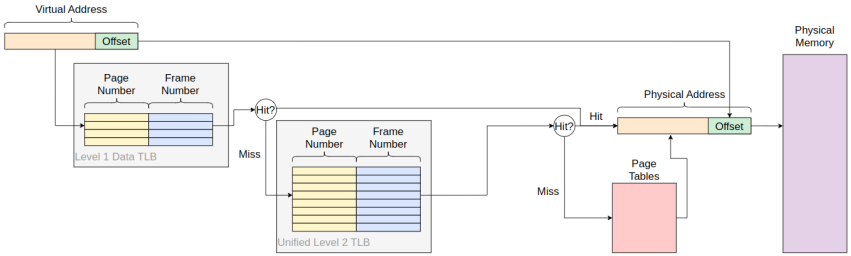
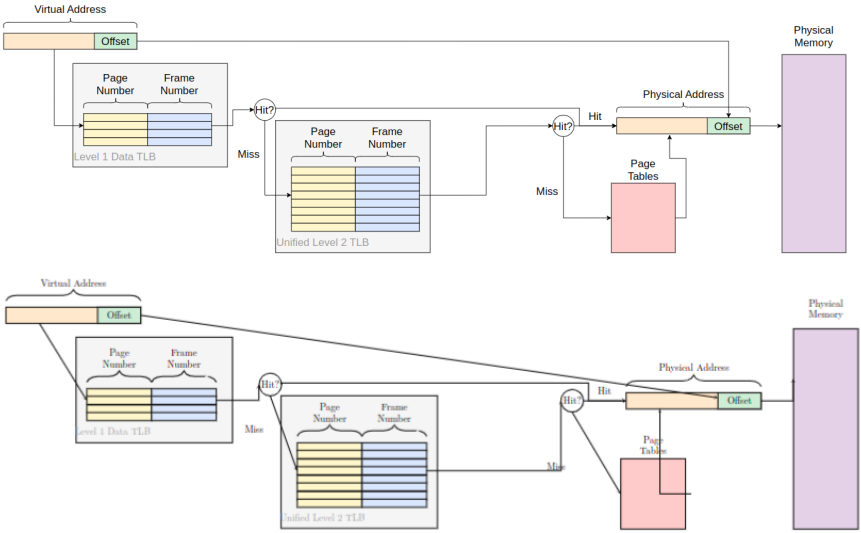
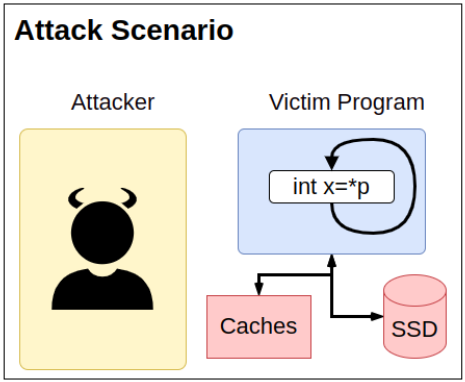
36 bits
L1 index
6 bits
offset
6 bits
page trans-lation
Physical Address
rest
32 bits
L2 index
10 bits
offset
6 bits
rest
31 bits
L3 index
11 bits
offset
6 bits
8 cache ways
L1 Cache
32 KB
64 cache sets
Non-Inclusive
4 cache ways
L2 Cache
256 KB
1024 cache sets
16 cache ways
Inclusive
L3 Cache
2 MB
2048 cache sets

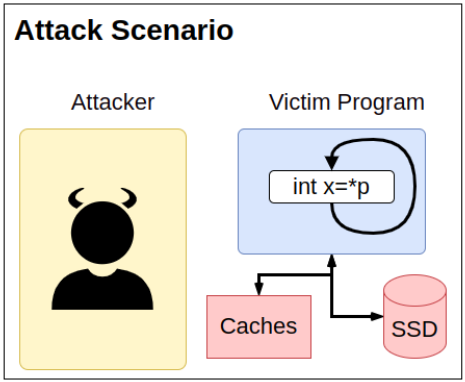
Draw.io2TikZ



Draw.io2TikZ




Attack Scenario
Attacker
Victim Program
int x=*p
Caches
SSD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int x=*p
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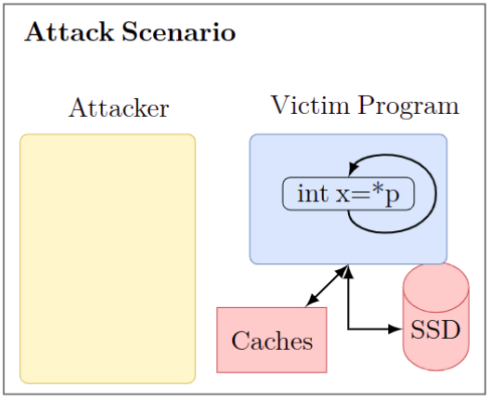
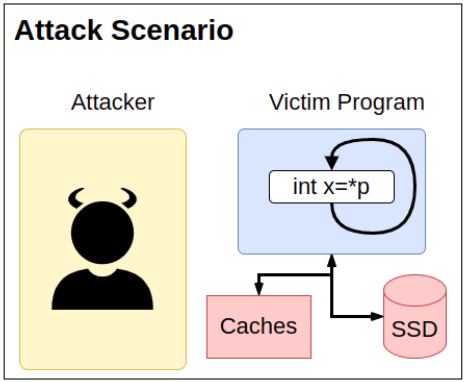
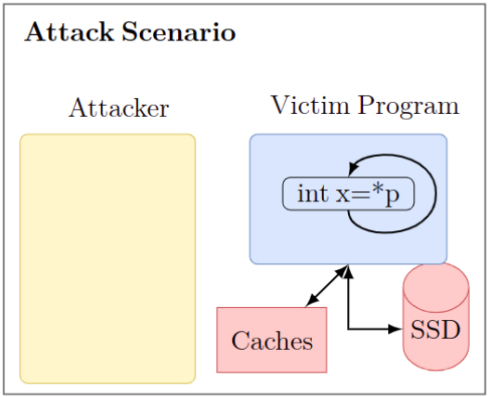
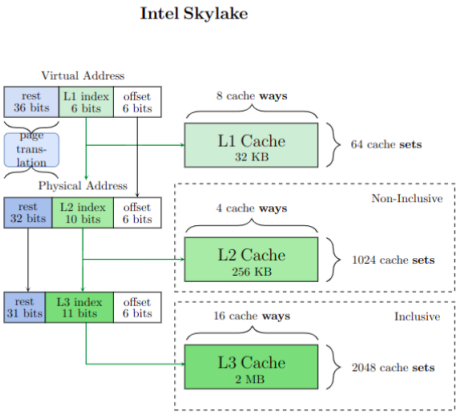

Attack Scenario
Attacker
Victim Program
int x=*p
Caches
SSD



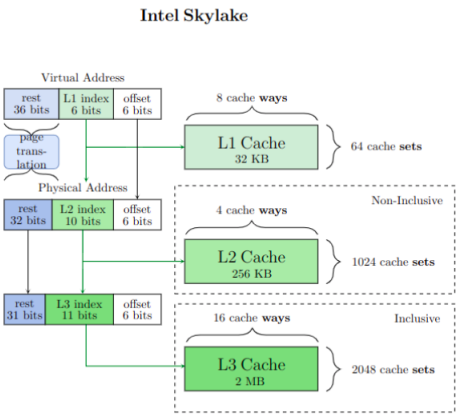


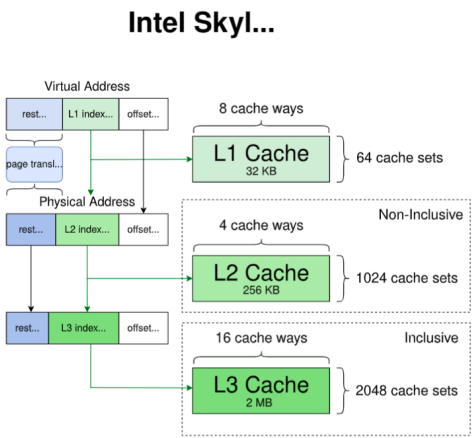

```
49 \node at (19.0,-44.5) [](IDIuFW-4){};
```

Draw.io2TikZ vs. svg2tikz



Draw.io2TikZ vs. svg2tikz





Attack

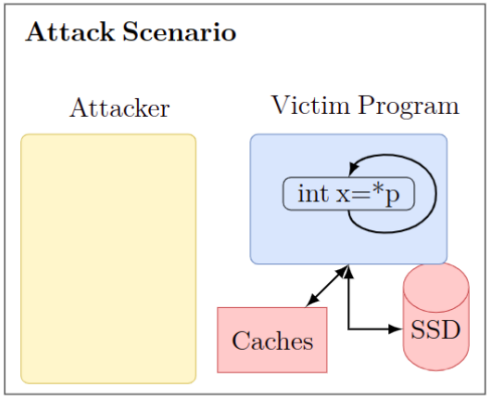
Attack

```
\hspace{-2cm}
\begin{tikzpicture}[scale = 0.33]
\definecolor{white}{RGB}{255,255,255}
\draw [draw=none] (26.3,-35.3) rectangle node(ID_Cn0XY-2)[align = center,
text width = 5.9 cm,inner sep=0] {\Large{\textbf{Attack}}} (43.7,-43.0);
\end{tikzpicture}
```

Attack

```
\hspace{-2cm}
\begin{tikzpicture}[scale = 0.33]
\definecolor{white}{RGB}{255,255,255}
\draw [draw=none] (26.3,-35.3) rectangle node(ID_Cn0XY-2)[align = center,
text width = 5.9 cm,inner sep=0] {\Large{\textbf{Attack}}} (43.7,-43.0);
\end{tikzpicture}
```

```
{
\newrgbcolor{curcolor}{0 0 0}
\pscustom[linestyle=none,fillstyle=solid,fillcolor=curcolor]
{
\newpath
\moveto(76.05204037,24.744)
\curveto(75.94004037,26.172)(75.63204037,27.096)(75.07204037,27.908)
\curveto(74.06404037,29.28)(72.30004037,30.092)(70.25604037,30.092)
\curveto(66.28004037,30.092)(63.73204037,26.956)(63.73204037,22.084)
\curveto(63.73204037,17.352)(66.25204037,14.356)(70.22804037,14.356)
\curveto(73.72804037,14.356)(75.94004037,16.456)(76.22004037,20.04)
\lineto(73.86804037,20.04)
\curveto(73.47604037,17.688)(72.27204037,16.512)(70.28404037,16.512)
\curveto(67.70804037,16.512)(66.16804037,18.612)(66.16804037,22.084)
\curveto(66.16804037,25.752)(67.68004037,27.936)(70.22804037,27.936)
\curveto(72.18804037,27.936)(73.42004037,26.788)(73.70004037,24.744)
\closepath
}
```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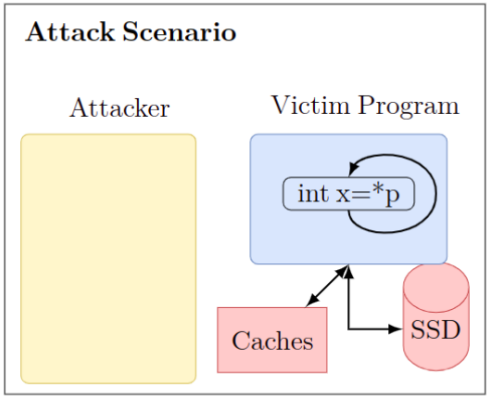
SSD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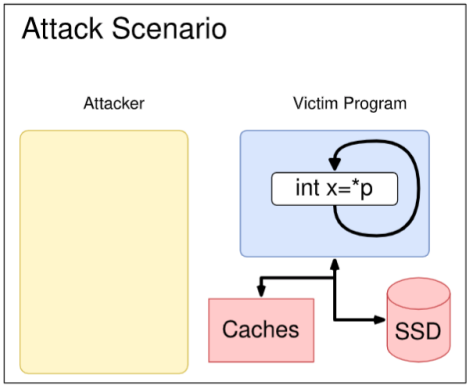
Attack Scenario
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int x=*p
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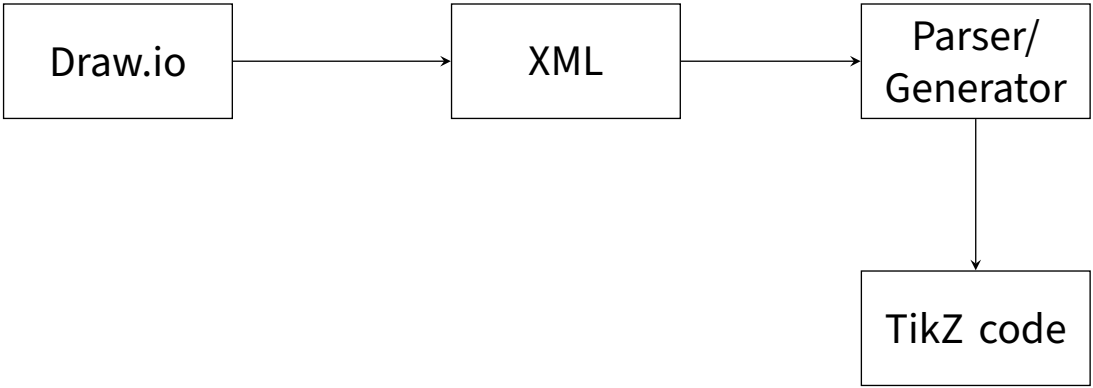
Conclusion

Conclusion

Draw.io

Conclusion

Conclusion


Draw.io
XML
Parser/
Generator
TikZ code

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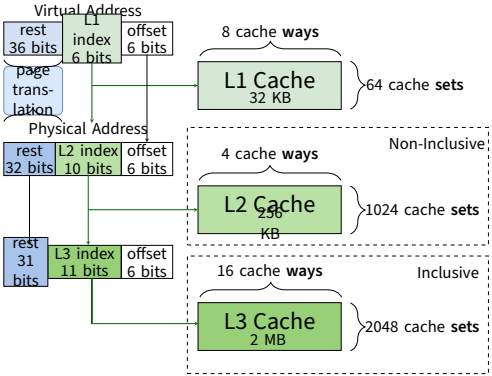
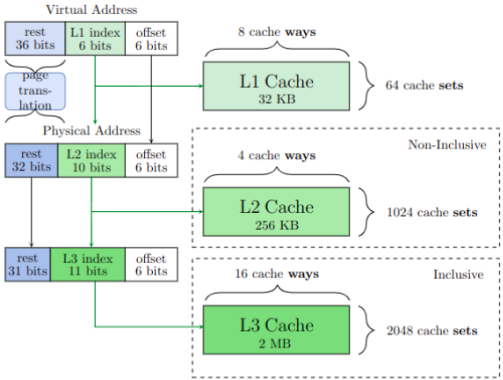
Draw.io2TikZ

Arthur Lippitz

Bachelor Thesis 2024

Intel Skylake



Intel Skylake