

# The Lua-UL package\*

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## 1 User-level interface

Lua-UL uses new capabilities of the LuaTeX engine to provide underlining/strikethrough/highlighting etc. support without breaking ligatures, kerning or restricting input. The predefined user-level commands are `\underLine`, `\highLight`, and `\strikeThrough`. (`\highLight` will only work correctly if the `luacolor` package is loaded) They are used as

```
\documentclass{article}
\usepackage{lua-ul}
\begin{document}
This package is \strikeThrough{useless}\underLine{awesome}!
\end{document}
```

This package is ~~useless~~awesome!

For limited compatibility with `soul`, the `soul` package option allows you to use the traditional macro names from `soul` instead:

```
\documentclass{article}
\usepackage[soul]{lua-ul}
\begin{document}
This package is \st{useless}\ul{awesome}!
\end{document}
```

The `\highLight` command highlights the argument in yellow by default. This color can be changed either by providing a color as optional argument or by changing the default through `\LuaULSetHighLightColor`:

---

\*This document corresponds to Lua-UL v0.0.3, dated 2020/03/17.

```

\documentclass{article}
\usepackage{xcolor,luacolor,lua-ul}
\LuaULSetHighLightColor{green}
\begin{document}
Lots of stuff is \highLight{important enough to be highlighted},
but only few things are dangerous enough to deserve
\highLight[red]{red highlighting.}

\LuaULSetHighLightColor{yellow}
Let's go back to traditional \highLight{highlighting}.
\end{document}

```

Lots of stuff is important enough to be highlighted, but only few things are dangerous enough to deserve red highlighting.  
 Let's go back to traditional highlighting.

## 2 Expert interface

`\newunderlinetype` Sometimes, you might try to solve more interesting problems than boring underlining, strikethrough or highlighting. Maybe you always wanted to be your own spell checker, want to demonstrate your love for ducks or you think that the traditional `\strikeThrough` is ~~not visible enough~~. For all these cases, you can define your own “underlining” command based on a TeX `\[cwg]leaders` command.

For this, use

```
\newunderlinetype<macro name>[<context specifier>]{<\leaders command>}
```

First, you have to pass the name of the command which should enable your new kind of underlining. (If you want to have an additional command which takes an argument and underlines this argument, you will have to define this manually.) The optional argument provides a “context”: This “context” has to expand to a string (something that can appear in a csname) which changes if the leaders box should be recalculated. The leader will be cached and reused whenever the context evaluates to the same string. So if your leaders should depend on the fontsize, the expansion of the context should contain the font size. If you leaders contain text in the current font, your context should include `\fontname`. The default context includes the current size of `1ex` and the current color if `luacolor` is loaded.

The final argument contains the actual leader command. You should omit the final glue normally passed to `\leaders`, so e.g. write `\leaders\hbox{ . }` without appending `\hfill` or `\hskip1pt` etc. The height and depth of your leaders is ignored to ensure that adding underlines etc. does not change the general text layout. It is your responsibility to ensure that you are not too high or too low and intercept other lines. On the other hand, running dimensions work fine if you use a rule.

For example, the special underline commands demonstrated above are implemented as

```
\usepackage{luacolor,tikzducks,pict2e}
\newunderlinetype\beginUnderDuck{\cleaders\hbox{%
  \begin{tikzpicture}[x=.5ex,y=.5ex,baseline=.8ex]%
    \duck
  \end{tikzpicture}}%
}
\newcommand\underDuck[1]{\beginUnderDuck#1}
\newunderlinetype\beginUnderWavy[\number\dimexpr1ex]{\cleaders\hbox{%
  \setlength\unitlength{.3ex}%
  \begin{picture}(4,0)(0,1)
    \thicklines
    \color{red}%
    \qbezier(0,0)(1,1)(2,0)
    \qbezier(2,0)(3,-1)(4,0)
  \end{picture}}%
}
\newcommand\underWavy[1]{\beginUnderWavy#1}
\newunderlinetype\beginStrikeThough{\leaders\hbox{%
  \normalfont\bfseries/%
}
}
\newcommand\StrikeThough[1]{\beginStrikeThough#1}
```

Here `\underWavy` uses a custom context because it doesn't change depending on the current font color.

If you only want to use `\newunderlinetype` and do not want to use the predefined underline types, you can use the `minimal` package option to disable them.

## 3 The implementation

### 3.1 Helper modules

First we need a separate Lua module `pre_append_to_vlist_filter` which provides a variant of the `append_to_vlist_filter` callback which can be used by multiple packages. This ensures that we are compatible with other packages implementing `append_to_vlist_filter`. First check if an equivalent to `pre_append_to_vlist_filter` already exists. The idea is that this might eventually get added to the kernel directly.

```
if luatexbase.callbacktypes.pre_append_to_vlist_filter then
  return
end

local call_callback = luatexbase.call_callback
local flush_node = node.flush_node
```

```

local prepend_prevdepth = node.prepend_prevdepth
local callback_define

```

HACK: Do not do this at home! We need to define the engine callback directly, so we use the debug library to get the “real” `callback.define`:

```

for i=1,5 do
  local name, func = debug.getupvalue(luatexbase.disable_callback, i)
  if name == 'callback_register' then
    callback_define = func
    break
  end
end
if not callback_define then
  error[[Unable to find callback.define]]
end

local function filtered_append_to_vlist_filter(box,
                                              locationcode,
                                              prevdepth,
                                              mirrored)

  local current = call_callback("pre_append_to_vlist_filter",
                                box, locationcode, prevdepth,
                                mirrored)

  if not current then
    flush_node(box)
    return
  elseif current == true then
    current = box
  end
  return call_callback("append_to_vlist_filter",
                      box, locationcode, prevdepth, mirrored)
end

callback_define('append_to_vlist_filter',
               filtered_append_to_vlist_filter)
luatexbase.callbacktypes.append_to_vlist_filter = nil
luatexbase.create_callback('append_to_vlist_filter', 'exclusive',
                          function(n, _, prevdepth)
                            return prepend_prevdepth(n, prevdepth)
                          end)
luatexbase.create_callback('pre_append_to_vlist_filter',
                          'list', false)

```

### 3.2 Lua module

Now we can define our main Lua module:

```

local unset_t = node.id'unset'
local hlist_t = node.id'hlist'
local vlist_t = node.id'vlist'

```

```

local kern_t = node.id'kern'
local glue_t = node.id'glue'

local char_given = token.command_id'char_given'

local underlineattrs = {}
local underline_types = {}
local underline_strict_flag = {}
local underline_over_flag = {}

local saved_values = {}
local function new_underline_type()
  for i=1,#underlineattrs do
    local attr = underlineattrs[i]
    saved_values[i] = tex.attribute[attr]
    tex.attribute[attr] = -0x7FFFFFFF
  end
  local strict_flag = token.scan_keyword'strict'
  local over_flag = token.scan_keyword'over'
  local b = token.scan_list()
  for i=1,#underlineattrs do
    tex.attribute[underlineattrs[i]] = saved_values[i]
  end
  local lead = b.head
  if not lead.leader then
    tex.error("Leader required", {"An underline type has to \z
      be defined by leader. You should use one of the", "commands \z
      \\leaders, \\cleaders, or \\xleader, or \\gleaders here."})
  else
    if lead.next then
      tex.error("Too many nodes", {"An underline type can only be \z
        defined by a single leaders specification,", "not by \z
        multiple nodes. Maybe you supplied an additional glue?",
        "Anyway, the additional nodes will be ignored"})
    end
    table.insert(underline_types, lead)
    b.head = lead.next
    node.flush_node(b)
  end
  token.put_next(token.new(#underline_types, char_given))
  underline_strict_flag[#underline_types] = strict_flag
  underline_over_flag[#underline_types] = over_flag
end

local function set_underline()
  local j
  for i=1,#underlineattrs do
    local attr = underlineattrs[i]
    if tex.attribute[attr] == -0x7FFFFFFF then
      j = attr
      break
    end
  end
end

```

```

        end
    end
    if not j then
        j = luatexbase.new_attribute(
            "luaul" .. tostring(#underlineattrs+1))
        underlineattrs[#underlineattrs+1] = j
    end
    tex.attribute[j] = token.scan_int()
end

local function reset_underline()
    local reset_all = token.scan_keyword'*'
    local j
    for i=1,#underlineattrs do
        local attr = underlineattrs[i]
        if tex.attribute[attr] ~= -0x7FFFFFFF then
            if reset_all then
                tex.attribute[attr] = -0x7FFFFFFF
            else
                j = attr
            end
        end
    end
    if not j then
        if not reset_all then
            tex.error("No underline active", {"You tried to disable \z
                underlining but underlining was not active in the first",
                "place. Maybe you wanted to ensure that \z
                no underling can be active anymore?", "Then you should \z
                append a *."})
        end
        return
    end
    tex.attribute[j] = -0x7FFFFFFF
end

local functions = lua.get_functions_table()
local set_lua = token.set_lua
local new_underline_type_func =
    luatexbase.new_luafunction"luaul.new_underline_type"
local set_underline_func =
    luatexbase.new_luafunction"luaul.set_underline_func"
local reset_underline_func =
    luatexbase.new_luafunction"luaul.reset_underline_func"
set_lua("LuaULNewUnderlineType", new_underline_type_func)
set_lua("LuaULSetUnderline", set_underline_func, "protected")
set_lua("LuaULResetUnderline", reset_underline_func, "protected")
functions[new_underline_type_func] = new_underline_type
functions[set_underline_func] = set_underline
functions[reset_underline_func] = reset_underline

```

A little helper to measure box contents and creating a glue node with inverted dimensions.

```

local stretch_fi = {}
local shrink_fi = {}
local function fil_levels(n)
  for i=0,4 do
    stretch_fi[i], shrink_fi[i] = 0, 0
  end
  for n in node.traverse_id(glue_t, n) do
    local order = n.stretch_order
    stretch_fi[order] = stretch_fi[order] + n.stretch
    order = n.shrink_order
    shrink_fi[order] = shrink_fi[order] + n.shrink
  end
  local stretch, shrink = 0, 0
  for i=0,4 do
    if stretch_fi[i] ~= 0 then
      stretch = i
    end
    if shrink_fi[i] ~= 0 then
      shrink = i
    end
  end
  return stretch, shrink
end
local function new_glue_neg_dimensions(n, t,
                                     stretch_order, shrink_order)

  local g = node.new(glue_t)
  g.width = -node.dimensions(n, t)
  g.next = n
  g.stretch_order = stretch_order
  g.stretch = -node.dimensions(1, 1, stretch_order, g, t)
  g.shrink_order = shrink_order
  g.shrink = node.dimensions(1, 2, shrink_order, g, t)
  g.next = nil
  return g
end

```

Now the actual undelining

```

local add_underline_hlist, add_underline_hbox, add_underline_vbox
local function add_underline_vlist(head, attr, outervalue)
  local iter, state, n = node.traverse_list(head)
  local t
  n, t = iter(state, n)
  while n ~= nil do
    local real_new_value = node.has_attribute(n, attr)
    local new_value = real_new_value ~= outervalue and real_new_value or nil
    if underline_strict_flag[new_value] or not new_value then
      if t == hlist_t then

```

```

        add_underline_hbox(n, attr, real_new_value)
    elseif t == vlist_t then
        add_underline_vbox(n, attr, real_new_value)
    end
    n, t = iter(state, n)
elseif real_new_value <= 0 then
    n, t = iter(state, n)
else
    local nn
    nn, t = iter(state, n)
    local prev, next = node.getboth(n)
    node.direct.setboth(node.direct.todirect(n), nil, nil)
    local shift = n.shift
    n.shift = 0
    local new_list = node.hpack(add_underline_hlist(n, attr))
    new_list.shift = shift
    node.direct.setlink(node.direct.todirect(prev), node.direct.todirect(new_list), node.direct.todirect(next))
    node.set_attribute(new_list, attr, 0)
    if n == head then
        head = new_list
    end
    n = nn
end
end
return head
end
function add_underline_vbox(head, attr, outervalue)
    if outervalue and outervalue <= 0 then return end
    head.head = add_underline_vlist(head.head, attr, outervalue)
    node.set_attribute(head, attr, outervalue and -outervalue or 0)
end
function add_underline_hlist(head, attr, outervalue)
    local used = false
    node.slide(head)
    local last_value
    local first
    local shrink_order, stretch_order
    for n in node.traverse(head) do
        local real_new_value = node.has_attribute(n, attr)
        local new_value
        if real_new_value then
            if real_new_value > 0 then
                node.set_attribute(n, attr, -real_new_value)
                new_value = real_new_value ~= outervalue and real_new_value or nil
            end
        else
            node.set_attribute(n, attr, 0)
        end
    end
    if n.id == hlist_t then
        if underline_strict_flag[new_value] or n.subtype == 3 or not new_value then

```



```

        add_underline_hbox(n, attr, real_new_value)
        new_value = nil
    end
elseif n.id == vlist_t then
    if underline_strict_flag[new_value] or not new_value then
        add_underline_vbox(n, attr, real_new_value)
        new_value = nil
    end
elseif n.id == kern_t and n.subtype == 0 then
    if n.next then
        local next_value = node.has_attribute(n.next, attr)
        if next_value == outervalue or not next_value then
            new_value = nil
        else
            new_value = last_value
        end
    else
        new_value = last_value
    end
elseif n.id == glue_t and (
    n.subtype == 8 or
    n.subtype == 9 or
    n.subtype == 15 or
false) then
    new_value = nil
end
if last_value ~= new_value then
    if not stretch_order then
        stretch_order, shrink_order = fil_levels(head)
    end
    if last_value then
        local glue = new_glue_neg_dimensions(first, n,
            stretch_order, shrink_order)
        local w, st, sh = node.getglue(glue)
        local lead = node.copy(underline_types[last_value])
        node.setglue(lead, -w, -st, -sh, stretch_order, shrink_order)
        if underline_over_flag[last_value] then
            head = node.insert_before(head, n, glue)
            node.insert_after(head, glue, lead)
        else
            head = node.insert_before(head, first, lead)
            node.insert_after(head, lead, glue)
        end
    end
    if new_value then
        first = n
    end
    last_value = new_value
end
end
end

```

```

if last_value then
    local glue = new_glue_neg_dimensions(first, nil,
        stretch_order, shrink_order)
    local w, st, sh = node.getglue(glue)
    local lead = node.copy(underline_types[last_value])
    node.setglue(lead, -w, -st, -sh, stretch_order, shrink_order)
    if underline_over_flag[last_value] then
        node.insert_after(head, node.tail(n), glue)
        node.insert_after(head, glue, lead)
    else
        head = node.insert_before(head, first, lead)
        node.insert_after(head, lead, glue)
    end
end
return head
end

function add_underline_hbox(head, attr, outervalue)
    if outervalue and outervalue <= 0 then return end
    head.head = add_underline_hlist(head.head, attr, outervalue)
    node.set_attribute(head, attr, outervalue and -outervalue or 0)
end

require'pre_append_to_vlist_filter'
luatexbase.add_to_callback('pre_append_to_vlist_filter',
    function(b, loc, prev, mirror)
        if loc == "post_linebreak" then
            for i = 1, #underlineattrs do
                add_underline_hbox(b, underlineattrs[i])
            end
        else
            for i = 1, #underlineattrs do
                local current = tex.attribute[underlineattrs[i]]
                local b_attr = node.has_attribute(b, underlineattrs[i])
                if b_attr and b_attr ~= current then
                    b = node.hpack(add_underline_hlist(n, attr))
                    node.set_attribute(b, attr, 0)
                end
            end
        end
        return b
    end, 'add underlines to list')
luatexbase.add_to_callback('hpack_filter',
    function(head, group, size, pack, dir, attr)
        for i = 1, #underlineattrs do
            local current
            for n in node.traverse(attr) do
                if n.number == underlineattrs[i] then
                    current = n.value
                end
            end
            add_underline_hlist(head, underlineattrs[i], current)
        end
    end

```

```

        end
        return head
    end, 'add underlines to list')
    luatexbase.add_to_callback('vpack_filter',
    function(head, group, size, pack, maxdepth, dir, attr)
    %     if true then return head end
        for i = 1, #underlineattrs do
            local current
            for n in node.traverse(attr) do
                if n.number == underlineattrs[i] then
                    current = n.value
                end
            end
            add_underline_vlist(head, underlineattrs[i], current)
        end
        return head
    end, 'add underlines to list')

```

### 3.3 T<sub>E</sub>X support package

Now only some L<sup>A</sup>T<sub>E</sub>X glue code is still needed Only LuaL<sup>A</sup>T<sub>E</sub>X is supported. For other engines we show an error.

```

\ifx\directlua\undefined
  \PackageError{lua-ul}{LuaLaTeX required}%
  {Lua-UL requires LuaLaTeX.
  Maybe you forgot to switch the engine in your editor?}
\fi
\directlua{require'lua-ul'}
\RequirePackage{xparse}

```

We support some options. Especially `minimal` will disable the predefined commands `\underLine` and `\strikeThrough` and allow you to define similar commands with your custom settings instead, `soul` tries to replicate names of the `soul` package.

```

\newif\ifluaul@predefined
\newif\ifluaul@soulnames
\luaul@predefinedtrue
\DeclareOption{minimal}{\luaul@predefinedfalse}
\DeclareOption{soul}{\luaul@soulnamestrue}
\ProcessOptions\relax

```

Just one more tiny helper.

```

\protected\def\luaul@maybedefineuse#1#2{%
  \unless\ifcsname#1\endcsname
    \expandafter\xdef\csname#1\endcsname{#2}%
  \fi
  \csname#1\endcsname
}

```

The default for the context argument. Give that most stuff should scale vertically with the font size, we expect most arguments to be given in `ex`. Additionally especially traditional underlines will use the currently active text color, so especially when `luacolor` is loaded we have to include the color attribute too.

```
\newcommand\luaul@defaultcontext{%
  \number\dimexpr1ex
  \@unless\ifx\undefined\LuaCol@Attribute
    \the\LuaCol@Attribute
  \fi
}
```

The main macro.

```
\NewDocumentCommand\newunderlinetype
{ E{*}{}} m O{\luaul@defaultcontext} m }{%
\newcommand#2{% "Reserve" the name
\protected\def#2{%
\expandafter\luaul@maybedefineuse
\expanded{{\csstring#2@@#3}}%
{\LuaULSetUnderline
\LuaULNewUnderlineType#1\hbox{#4\hskip0pt}}%
}}%
}
\ifluaul@predefined
```

For `\highLight`, the color should be customizable. There are two cases: If `xcolor` is not loaded, we just accept a simple color name. Otherwise, we accept color as documented in `xcolor` for `PSTricks`: Either a color name, a color expression or a combination of `colormodel` and associated values.

```
\newcommand\luaul@highlight@color{yellow}
\def\luaul@@setcolor\xcolor@#1#2{%
\newcommand\luaul@setcolor[1]{%
\ifx\XC@getcolor\undefined
\def\luaul@highlight@currentcolor{#1}
\else
\begingroup
\XC@getcolor{#1}\luaul@tmpcolor
\expanded{\endgroup
\def\noexpand\luaul@highlight@currentcolor{%
\expandafter\luaul@@setcolor\luaul@tmpcolor}}%
\fi
}
```

Now a user-level command to set the default color.

```
\NewDocumentCommand\LuaULSetHighLightColor{om}{%
\edef\luaul@highlight@color{\IfValueTF{#1}{\luaul@highlight@color{#1}}{#2}}%
}
```

The sizes for the predefined commands are stolen from the “soul” default values.

```
\newunderlinetype\@underLine%
{\leaders\vrule height -.65ex depth .75ex}
\newcommand\underLine[1]{\@underLine#1}
```

```

\newunderlinetype\@strikeThrough%
  {\leaders\vrule height .55ex depth -.45ex}
\newcommand\strikeThrough[1]{\@strikeThrough#1}}

\newunderlinetype\@highLight[\number\dimexpr1ex%
                             \luaul@highlight@currentcolor]%
  {%
    \ifx\XC@getcolor\undefined
      \color{\luaul@highlight@currentcolor}%
    \else
      \expandafter\XC@undeclaredcolor\luaul@highlight@currentcolor
    \fi
    \leaders\vrule height 1.75ex depth .75ex
  }
\newcommand\highLight[2][\luaul@highlight@color]{%
  \luaul@setcolor{#1}%
  \@highLight#2%
}
\ifluaul@soulnames
  \let\textul\underLine \let\ul\textul
  \let\textst\strikeThrough \let\st\textst
  \let\texthl\highLight \let\hl\texthl
\fi
\fi

```

Finally patch `\reset@font` to ensure that underlines do not propagate into unexpected places.

```

\ifx \reset@font \normalfont
  \let \reset@font \relax
  \DeclareRobustCommand \reset@font {%
    \normalfont
    \LuaULResetUnderline*%
  }
\else
  \MakeRobust \reset@font
  \begingroup
    \expandafter \let
      \expandafter \helper
      \csname reset@font \endcsname
  \expandafter \endgroup
  \expandafter \gdef
    \csname reset@font \expandafter \endcsname
  \expandafter {%
    \helper%
    \LuaULResetUnderline*%
  }
\fi

```

## Change History

0.0.1		Patch <code>\reset@font</code> . . . . .	12
General: Initial release . . . . .	3	0.0.3	
0.0.2		General: Make streight lines over	
General: Add command to		hboxes . . . . .	7
disable active underlining . . . .	6	Use glue instead of kern to	
Allow <code>\highLight</code> color		allow handling unset lists . . . .	6
customization . . . . .	11		