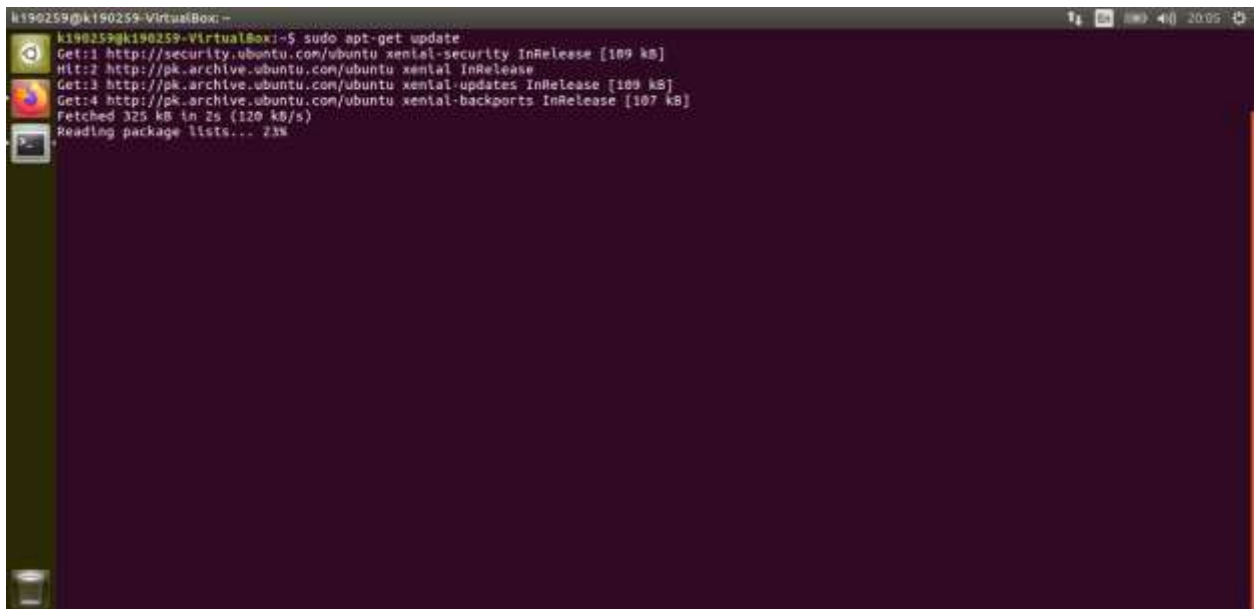


## SYSTEM CALL ASSIGNMENT (OPERATING SYSTEM)

Name : Ibadullah Shaikh  
Roll No : 19K-0259  
Section : BCS- 4H  
Instructor : Mam. Rabia Ansari

---

### 1. Update



```
k190259@k190259-VirtualBox:~$ sudo apt-get update
Get:1 http://security.ubuntu.com/ubuntu xenial-security InRelease [109 kB]
Hit:2 http://pk.archive.ubuntu.com/ubuntu xenial InRelease
Get:3 http://pk.archive.ubuntu.com/ubuntu xenial-updates InRelease [109 kB]
Get:4 http://pk.archive.ubuntu.com/ubuntu xenial-backports InRelease [107 kB]
Fetched 325 kB in 2s (120 kB/s)
Reading package lists... 23%
```

### 3. Completed Upgrade command

## 4. Installing GCC

```
root@k190259-VirtualBox:~#  
k190259@k190259-VirtualBox:~$ sudo -s  
[sudo] password for k190259:  
root@k190259-VirtualBox:~# apt-get install gcc  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
gcc is already the newest version (4:5.3.1-1ubuntu1).  
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.  
root@k190259-VirtualBox:~#
```

## 5. Installing Python Library

```
root@k190259-VirtualBox:~#  
root@k190259-VirtualBox:~# apt-get install python3-pip python3-dev libffi-dev libssl-dev libxml2-dev libxslt1-dev libjpeg-dev  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following additional packages will be installed:  
  icu-devtools libexpat1-dev libicu-dev libjpeg-turbo8-dev libpython3-dev libpython3.5-dev libssl-doc python-pip-whl python3-setuptools  
  python3-wheel python3.5-dev zlib1g-dev  
Suggested packages:  
  icu-doc python-setuptools-doc  
The following NEW packages will be installed:  
  icu-devtools libexpat1-dev libffi-dev libicu-dev libjpeg-turbo8-dev libjpeg8-dev libpython3-dev libpython3.5-dev libssl-doc  
  libxml2-dev libxslt1-dev python-pip-whl python3-dev python3-pip python3-setuptools python3-wheel python3.5-dev zlib1g-dev  
0 upgraded, 19 newly installed, 0 to remove and 3 not upgraded.  
Need to get 32.1 MB of archives.  
After this operation, 117 MB of additional disk space will be used.  
Do you want to continue? [Y/n] y  
Get:1 http://pk.archive.ubuntu.com/ubuntu xenial-updates/main amd64 icu-devtools amd64 55.1-7ubuntu0.5 [166 kB]  
Get:2 http://pk.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libexpat1-dev amd64 2.1.0-7ubuntu0.16.04.5 [115 kB]  
Get:3 http://pk.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libicu-dev amd64 55.1-7ubuntu0.5 [8,546 kB]  
3% [3 libicu-dev 251 kB/8,546 kB 3%]
```

## 6. Installing libncursesw5-dev

```
root@k190259-VirtualBox:~# apt-get install libncursesw5-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libtinfo-dev
Suggested packages:
  ncurses-doc
The following NEW packages will be installed:
  libncursesw5-dev libtinfo-dev
0 upgraded, 2 newly installed, 0 to remove and 3 not upgraded.
Need to get 375 kB of archives.
After this operation, 1,582 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://pk.archive.ubuntu.com/ubuntu xenial/main amd64 libtinfo-dev amd64 6.0+20160213-1ubuntu1 [77.4 kB]
Get:2 http://pk.archive.ubuntu.com/ubuntu xenial/main amd64 libncursesw5-dev amd64 6.0+20160213-1ubuntu1 [198 kB]
73% [2 libncursesw5-dev 140 kB/198 kB 71%]
```

## 7. Checking version and getting updated version (4.15.1)

```
k190259@k190259-VirtualBox:~$ uname -r
4.15.0-112-generic
k190259@k190259-VirtualBox:~$ wget https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.15.1.tar.gz
--2021-03-30 20:45:22-- https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.15.1.tar.gz
Resolving www.kernel.org (www.kernel.org)... 147.75.46.191, 2604:1380:4080:c00::1
Connecting to www.kernel.org (www.kernel.org)[147.75.46.191]:443... connected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: https://mirrors.edge.kernel.org/pub/linux/kernel/v4.x/linux-4.15.1.tar.gz [following]
--2021-03-30 20:45:22-- https://mirrors.edge.kernel.org/pub/linux/kernel/v4.x/linux-4.15.1.tar.gz
Resolving mirrors.edge.kernel.org (mirrors.edge.kernel.org)... 147.75.101.1, 2004:1380:2001:3900::1
Connecting to mirrors.edge.kernel.org (mirrors.edge.kernel.org)[147.75.101.1]:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 157662372 (150M) [application/x-gzip]
Saving to: 'linux-4.15.1.tar.gz'

linux-4.15.1.tar.gz          1%[                  ] 1.51M  927KB/s
```

## 8. Version updated making changes in files as done in video.

```
root@k190259-VirtualBox: /usr/src/linux-4.15.1/helloworld
root@k190259-VirtualBox:~# ls
Desktop Documents Downloads examples.desktop linux-4.15.1.tar.gz Music Pictures Public Templates Videos
root@k190259-VirtualBox:~# cd /usr/src/
root@k190259-VirtualBox:/usr/src# cd /linux-4.15.1
bash: cd: /linux-4.15.1: No such file or directory
root@k190259-VirtualBox:/usr/src# cd /linux-4.15.1/
bash: cd: /linux-4.15.1/: No such file or directory
root@k190259-VirtualBox:/usr/src# cd linux-4.15.1
root@k190259-VirtualBox:/usr/src/linux-4.15.1# ls
arch certs CREDITS Documentation firmware include ipc Kconfig lib Makefile net samples security tools virt
block COPYING crypto drivers fs init Kbuild kernel MAINTAINERS mm README scripts sound usr
root@k190259-VirtualBox:/usr/src/linux-4.15.1# mkdir helloworld
root@k190259-VirtualBox:/usr/src/linux-4.15.1# cd helloworld
root@k190259-VirtualBox:/usr/src/linux-4.15.1/helloworld# gedit helloworld.c

(gedit:7246): Gtk-WARNING **: Calling Inhibit failed: GDBus.Error:org.freedesktop.DBus.Error.ServiceUnknown: The name org.gnome.SessionManager w
as not provided by any .service files

** (gedit:7246): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-spell-enabled not supported
** (gedit:7246): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-encoding not supported
** (gedit:7246): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-spell-enabled not supported
** (gedit:7246): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-encoding not supported
** (gedit:7246): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-spell-enabled not supported
** (gedit:7246): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-encoding not supported
** (gedit:7246): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-position not supported
root@k190259-VirtualBox:/usr/src/linux-4.15.1/helloworld#
```

## 9. helloworld.c

```
helloworld.c (/usr/src/linux-4.15.1/helloworld) : gedit
helloworld.c
#include<linux/kernel.h>
asm__linkage long sys_helloworld(void) {
    printk("Hello world\n");
    return 0;
}

C Tab width: 8 Ln 5, Col 2 INS
```



## 10. Makefile

```
root@k190259-VirtualBox: /usr/src/linux-4.15.1/include/linux
root@k190259-VirtualBox: /usr/src/linux-4.15.1/helloworld# gedit Makefile
(gedit:7300): Gtk-WARNING **: Calling Inhibit failed: GDBus.Error:org.freedesktop.DBus.Error.ServiceUnknown: The name org.gnome.SessionManager was not provided by any .service files
** (gedit:7300): WARNING **: Set document metadata failed: Setting attribute metadata::gedit-spell-enabled not supported
** (gedit:7300): WARNING **: Set document metadata failed: Setting attribute metadata::gedit-encoding not supported
** (gedit:7300): WARNING **: Set document metadata failed: Setting attribute metadata::gedit-position not supported
root@k190259-VirtualBox: /usr/src/linux-4.15.1/helloworld# cd ../
root@k190259-VirtualBox: /usr/src/linux-4.15.1# gedit Makefile
(gedit:7332): Gtk-WARNING **: Calling Inhibit failed: GDBus.Error:org.freedesktop.DBus.Error.ServiceUnknown: The name org.gnome.SessionManager was not provided by any .service files
** (gedit:7332): WARNING **: Set document metadata failed: Setting attribute metadata::gedit-spell-enabled not supported
** (gedit:7332): WARNING **: Set document metadata failed: Setting attribute metadata::gedit-encoding not supported
** (gedit:7332): WARNING **: Set document metadata failed: Setting attribute metadata::gedit-position not supported
root@k190259-VirtualBox: /usr/src/linux-4.15.1# cd include/linux
root@k190259-VirtualBox: /usr/src/linux-4.15.1/include/linux#
```

## 11. Adding helloworld file

```
*Makefile (/usr/src/linux-4.15.1) - gedit
#
# This file is part of the Linux kernel.
#
# Copyright (C) 2000-2001, 2003-2004, 2006-2007, 2009-2010, 2012-2013, 2015-2016, 2018-2019, 2020-2021, 2022-2023, 2024-2025, 2026-2027, 2028-2029, 2030-2031, 2032-2033, 2034-2035, 2036-2037, 2038-2039, 2040-2041, 2042-2043, 2044-2045, 2046-2047, 2048-2049, 2050-2051, 2052-2053, 2054-2055, 2056-2057, 2058-2059, 2060-2061, 2062-2063, 2064-2065, 2066-2067, 2068-2069, 2070-2071, 2072-2073, 2074-2075, 2076-2077, 2078-2079, 2080-2081, 2082-2083, 2084-2085, 2086-2087, 2088-2089, 2090-2091, 2092-2093, 2094-2095, 2096-2097, 2098-2099, 2100-2101, 2102-2103, 2104-2105, 2106-2107, 2108-2109, 2110-2111, 2112-2113, 2114-2115, 2116-2117, 2118-2119, 2120-2121, 2122-2123, 2124-2125, 2126-2127, 2128-2129, 2130-2131, 2132-2133, 2134-2135, 2136-2137, 2138-2139, 2140-2141, 2142-2143, 2144-2145, 2146-2147, 2148-2149, 2150-2151, 2152-2153, 2154-2155, 2156-2157, 2158-2159, 2160-2161, 2162-2163, 2164-2165, 2166-2167, 2168-2169, 2170-2171, 2172-2173, 2174-2175, 2176-2177, 2178-2179, 2180-2181, 2182-2183, 2184-2185, 2186-2187, 2188-2189, 2190-2191, 2192-2193, 2194-2195, 2196-2197, 2198-2199, 2200-2201, 2202-2203, 2204-2205, 2206-2207, 2208-2209, 2210-2211, 2212-2213, 2214-2215, 2216-2217, 2218-2219, 2220-2221, 2222-2223, 2224-2225, 2226-2227, 2228-2229, 2230-2231, 2232-2233, 2234-2235, 2236-2237, 2238-2239, 2240-2241, 2242-2243, 2244-2245, 2246-2247, 2248-2249, 2250-2251, 2252-2253, 2254-2255, 2256-2257, 2258-2259, 2260-2261, 2262-2263, 2264-2265, 2266-2267, 2268-2269, 2270-2271, 2272-2273, 2274-2275, 2276-2277, 2278-2279, 2280-2281, 2282-2283, 2284-2285, 2286-2287, 2288-2289, 2290-2291, 2292-2293, 2294-2295, 2296-2297, 2298-2299, 2300-2301, 2302-2303, 2304-2305, 2306-2307, 2308-2309, 2310-2311, 2312-2313, 2314-2315, 2316-2317, 2318-2319, 2320-2321, 2322-2323, 2324-2325, 2326-2327, 2328-2329, 2330-2331, 2332-2333, 2334-2335, 2336-2337, 2338-2339, 2340-2341, 2342-2343, 2344-2345, 2346-2347, 2348-2349, 2350-2351, 2352-2353, 2354-2355, 2356-2357, 2358-2359, 2360-2361, 2362-2363, 2364-2365, 2366-2367, 2368-2369, 2370-2371, 2372-2373, 2374-2375, 2376-2377, 2378-2379, 2380-2381, 2382-2383, 2384-2385, 2386-2387, 2388-2389, 2390-2391, 2392-2393, 2394-2395, 2396-2397, 2398-2399, 2400-2401, 2402-2403, 2404-2405, 2406-2407, 2408-2409, 2410-2411, 2412-2413, 2414-2415, 2416-2417, 2418-2419, 2420-2421, 2422-2423, 2424-2425, 2426-2427, 2428-2429, 2430-2431, 2432-2433, 2434-2435, 2436-2437, 2438-2439, 2440-2441, 2442-2443, 2444-2445, 2446-2447, 2448-2449, 2450-2451, 2452-2453, 2454-2455, 2456-2457, 2458-2459, 2460-2461, 2462-2463, 2464-2465, 2466-2467, 2468-2469, 2470-2471, 2472-2473, 2474-2475, 2476-2477, 2478-2479, 2480-2481, 2482-2483, 2484-2485, 2486-2487, 2488-2489, 2490-2491, 2492-2493, 2494-2495, 2496-2497, 2498-2499, 2500-2501, 2502-2503, 2504-2505, 2506-2507, 2508-2509, 2510-2511, 2512-2513, 2514-2515, 2516-2517, 2518-2519, 2520-2521, 2522-2523, 2524-2525, 2526-2527, 2528-2529, 2530-2531, 2532-2533, 2534-2535, 2536-2537, 2538-2539, 2540-2541, 2542-2543, 2544-2545, 2546-2547, 2548-2549, 2550-2551, 2552-2553, 2554-2555, 2556-2557, 2558-2559, 2560-2561, 2562-2563, 2564-2565, 2566-2567, 2568-2569, 2570-2571, 2572-2573, 2574-2575, 2576-2577, 2578-2579, 2580-2581, 2582-2583, 2584-2585, 2586-2587, 2588-2589, 2590-2591, 2592-2593, 2594-2595, 2596-2597, 2598-2599, 2600-2601, 2602-2603, 2604-2605, 2606-2607, 2608-2609, 2610-2611, 2612-2613, 2614-2615, 2616-2617, 2618-2619, 2620-2621, 2622-2623, 2624-2625, 2626-2627, 2628-2629, 2630-2631, 2632-2633, 2634-2635, 2636-2637, 2638-2639, 2640-2641, 2642-2643, 2644-2645, 2646-2647, 2648-2649, 2650-2651, 2652-2653, 2654-2655, 2656-2657, 2658-2659, 2660-2661, 2662-2663, 2664-2665, 2666-2667, 2668-2669, 2670-2671, 2672-2673, 2674-2675, 2676-2677, 2678-2679, 2680-2681, 2682-2683, 2684-2685, 2686-2687, 2688-2689, 2690-2691, 2692-2693, 2694-2695, 2696-2697, 2698-2699, 2700-2701, 2702-2703, 2704-2705, 2706-2707, 2708-2709, 2710-2711, 2712-2713, 2714-2715, 2716-2717, 2718-2719, 2720-2721, 2722-2723, 2724-2725, 2726-2727, 2728-2729, 2730-2731, 2732-2733, 2734-2735, 2736-2737, 2738-2739, 2740-2741, 2742-2743, 2744-2745, 2746-2747, 2748-2749, 2750-2751, 2752-2753, 2754-2755, 2756-2757, 2758-2759, 2760-2761, 2762-2763, 2764-2765, 2766-2767, 2768-2769, 2770-2771, 2772-2773, 2774-2775, 2776-2777, 2778-2779, 2780-2781, 2782-2783, 2784-2785, 2786-2787, 2788-2789, 2790-2791, 2792-2793, 2794-2795, 2796-2797, 2798-2799, 2800-2801, 2802-2803, 2804-2805, 2806-2807, 2808-2809, 2810-2811, 2812-2813, 2814-2815, 2816-2817, 2818-2819, 2820-2821, 2822-2823, 2824-2825, 2826-2827, 2828-2829, 2830-2831, 2832-2833, 2834-2835, 2836-2837, 2838-2839, 2840-2841, 2842-2843, 2844-2845, 2846-2847, 2848-2849, 2850-2851, 2852-2853, 2854-2855, 2856-2857, 2858-2859, 2860-2861, 2862-2863, 2864-2865, 2866-2867, 2868-2869, 2870-2871, 2872-2873, 2874-2875, 2876-2877, 2878-2879, 2880-2881, 2882-2883, 2884-2885, 2886-2887, 2888-2889, 2890-2891, 2892-2893, 2894-2895, 2896-2897, 2898-2899, 2900-2901, 2902-2903, 2904-2905, 2906-2907, 2908-2909, 2910-2911, 2912-2913, 2914-2915, 2916-2917, 2918-2919, 2920-2921, 2922-2923, 2924-2925, 2926-2927, 2928-2929, 2930-2931, 2932-2933, 2934-2935, 2936-2937, 2938-2939, 2940-2941, 2942-2943, 2944-2945, 2946-2947, 2948-2949, 2950-2951, 2952-2953, 2954-2955, 2956-2957, 2958-2959, 2960-2961, 2962-2963, 2964-2965, 2966-2967, 2968-2969, 2970-2971, 2972-2973, 2974-2975, 2976-2977, 2978-2979, 2980-2981, 2982-2983, 2984-2985, 2986-2987, 2988-2989, 2990-2991, 2992-2993, 2994-2995, 2996-2997, 2998-2999, 3000-3001, 3002-3003, 3004-3005, 3006-3007, 3008-3009, 3010-3011, 3012-3013, 3014-3015, 3016-3017, 3018-3019, 3020-3021, 3022-3023, 3024-3025, 3026-3027, 3028-3029, 3030-3031, 3032-3033, 3034-3035, 3036-3037, 3038-3039, 3040-3041, 3042-3043, 3044-3045, 3046-3047, 3048-3049, 3050-3051, 3052-3053, 3054-3055, 3056-3057, 3058-3059, 3060-3061, 3062-3063, 3064-3065, 3066-3067, 3068-3069, 3070-3071, 3072-3073, 3074-3075, 3076-3077, 3078-3079, 3080-3081, 3082-3083, 3084-3085, 3086-3087, 3088-3089, 3090-3091, 3092-3093, 3094-3095, 3096-3097, 3098-3099, 3100-3101, 3102-3103, 3104-3105, 3106-3107, 3108-3109, 3110-3111, 3112-3113, 3114-3115, 3116-3117, 3118-3119, 3120-3121, 3122-3123, 3124-3125, 3126-3127, 3128-3129, 3130-3131, 3132-3133, 3134-3135, 3136-3137, 3138-3139, 3140-3141, 3142-3143, 3144-3145, 3146-3147, 3148-3149, 3150-3151, 3152-3153, 3154-3155, 3156-3157, 3158-3159, 3160-3161, 3162-3163, 3164-3165, 3166-3167, 3168-3169, 3170-3171, 3172-3173, 3174-3175, 3176-3177, 3178-3179, 3180-3181, 3182-3183, 3184-3185, 3186-3187, 3188-3189, 3190-3191, 3192-3193, 3194-3195, 3196-3197, 3198-3199, 3200-3201, 3202-3203, 3204-3205, 3206-3207, 3208-3209, 3210-3211, 3212-3213, 3214-3215, 3216-3217, 3218-3219, 3220-3221, 3222-3223, 3224-3225, 3226-3227, 3228-3229, 3230-3231, 3232-3233, 3234-3235, 3236-3237, 3238-3239, 3240-3241, 3242-3243, 3244-3245, 3246-3247, 3248-3249, 3250-3251, 3252-3253, 3254-3255, 3256-3257, 3258-3259, 3260-3261, 3262-3263, 3264-3265, 3266-3267, 3268-3269, 3270-3271, 3272-3273, 3274-3275, 3276-3277, 3278-3279, 3280-3281, 3282-3283, 3284-3285, 3286-3287, 3288-3289, 3290-3291, 3292-3293, 3294-3295, 3296-3297, 3298-3299, 3300-3301, 3302-3303, 3304-3305, 3306-3307, 3308-3309, 3310-3311, 3312-3313, 3314-3315, 3316-3317, 3318-3319, 3320-3321, 3322-3323, 3324-3325, 3326-3327, 3328-3329, 3330-3331, 3332-3333, 3334-3335, 3336-3337, 3338-3339, 3340-3341, 3342-3343, 3344-3345, 3346-3347, 3348-3349, 3350-3351, 3352-3353, 3354-3355, 3356-3357, 3358-3359, 3360-3361, 3362-3363, 3364-3365, 3366-3367, 3368-3369, 3370-3371, 3372-3373, 3374-3375, 3376-3377, 3378-3379, 3380-3381, 3382-3383, 3384-3385, 3386-3387, 3388-3389, 3390-3391, 3392-3393, 3394-3395, 3396-3397, 3398-3399, 3400-3401, 3402-3403, 3404-3405, 3406-3407, 3408-3409, 3410-3411, 3412-3413, 3414-3415, 3416-3417, 3418-3419, 3420-3421, 3422-3423, 3424-3425, 3426-3427, 3428-3429, 3430-3431, 3432-3433, 3434-3435, 3436-3437, 3438-3439, 3440-3441, 3442-3443, 3444-3445, 3446-3447, 3448-3449, 3450-3451, 3452-3453, 3454-3455, 3456-3457, 3458-3459, 3460-3461, 3462-3463, 3464-3465, 3466-3467, 3468-3469, 3470-3471, 3472-3473, 3474-3475, 3476-3477, 3478-3479, 3480-3481, 3482-3483, 3484-3485, 3486-3487, 3488-3489, 3490-3491, 3492-3493, 3494-3495, 3496-3497, 3498-3499, 3500-3501, 3502-3503, 3504-3505, 3506-3507, 3508-3509, 3510-3511, 3512-3513, 3514-3515, 3516-3517, 3518-3519, 3520-3521, 3522-3523, 3524-3525, 3526-3527, 3528-3529, 3530-3531, 3532-3533, 3534-3535, 3536-3537, 3538-3539, 3540-3541, 3542-3543, 3544-3545, 3546-3547, 3548-3549, 3550-3551, 3552-3553, 3554-3555, 3556-3557, 3558-3559, 3560-3561, 3562-3563, 3564-3565, 3566-3567, 3568-3569, 3570-3571, 3572-3573, 3574-3575, 3576-3577, 3578-3579, 3580-3581, 3582-3583, 3584-3585, 3586-3587, 3588-3589, 3590-3591, 3592-3593, 3594-3595, 3596-3597, 3598-3599, 3600-3601, 3602-3603, 3604-3605, 3606-3607, 3608-3609, 3610-3611, 3612-3613, 3614-3615, 3616-3617, 3618-3619, 3620-3621, 3622-3623, 3624-3625, 3626-3627, 3628-3629, 3630-3631, 3632-3633, 3634-3635, 3636-3637, 3638-3639, 3640-3641, 3642-3643, 3644-3645, 3646-3647, 3648-3649, 3650-3651, 3652-3653, 3654-3655, 3656-3657, 3658-3659, 3660-3661, 3662-3663, 3664-3665, 3666-3667, 3668-3669, 3670-3671, 3672-3673, 3674-3675, 3676-3677, 3678-3679, 3680-3681, 3682-3683, 3684-3685, 3686-3687, 3688-3689, 3690-3691, 3692-3693, 3694-3695, 3696-3697, 3698-3699, 3700-3701, 3702-3703, 3704-3705, 3706-3707, 3708-3709, 3710-3711, 3712-3713, 3714-3715, 3716-3717, 3718-3719, 3720-3721, 3722-3723, 3724-3725, 3726-3727, 3728-3729, 3730-3731, 3732-3733, 3734-3735, 3736-3737, 3738-3739, 3740-3741, 3742-3743, 3744-3745, 3746-3747, 3748-3749, 3750-3751, 3752-3753, 3754-3755, 3756-3757, 3758-3759, 3760-3761, 3762-3763, 3764-3765, 3766-3767, 3768-3769, 3770-3771, 3772-3773, 3774-3775, 3776-3777, 3778-3779, 3780-3781, 3782-3783, 3784-3785, 3786-3787, 3788-3789, 3790-3791, 3792-3793, 3794-3795, 3796-3797, 3798-3799, 3800-3801, 3802-3803, 3804-3805, 3806-3807, 3808-3809, 3810-3811, 3812-3813, 3814-3815, 3816-3817, 3818-3819, 3820-3821, 3822-3823, 3824-3825, 3826-3827, 3828-3829, 3830-3831, 3832-3833, 3834-3835, 3836-3837, 3838-3839, 3840-3841, 3842-3843, 3844-3845, 3846-3847, 3848-3849, 3850-3851, 3852-3853, 3854-3855, 3856-3857, 3858-3859, 3860-3861, 3862-3863, 3864-3865, 3866-3867, 3868-3869, 3870-3871, 3872-3873, 3874-3875, 3876-3877, 3878-3879, 3880-3881, 3882-3883, 3884-3885, 3886-3887, 3888-3889, 3890-3891, 3892-3893, 3894-3895, 3896-3897, 3898-3899, 3900-3901, 3902-3903, 3904-3905, 3906-3907, 3908-3909, 3910-3911, 3912-3913, 3914-3915, 3916-3917, 3918-3919, 3920-3921, 3922-3923, 3924-3925, 3926-3927, 3928-3929, 3930-3931, 3932-3933, 3934-3935, 3936-3937, 3938-3939, 3940-3941, 3942-3943, 3944-3945, 3946-3947, 3948-3949, 3950-3951, 3952-3953, 3954-3955, 3956-3957, 3958-3959, 3960-3961, 3962-3963, 3964-3965, 3966-3967, 3968-3969, 3970-3971, 3972-3973, 3974-3975, 3976-3977, 3978-3979, 3980-3981, 3982-3983, 3984-3985, 3986-3987, 3988-3989, 3990-3991, 3992-3993, 3994-3995, 3996-3997, 3998-3999, 4000-4001, 4002-4003, 4004-4005, 4006-4007, 4008-4009, 4010-4011, 4012-4013, 4014-4015, 4016-4017, 4018-4019, 4020-4021, 4022-4023, 4024-4025, 4026-4027, 4028-4029, 4030-4031, 4032-4033, 4034-4035, 4036-4037, 4038-4039, 4040-4041, 4042-4043, 4044-4045, 4046-4047, 4048-4049, 4050-4051, 4052-4053, 4054-4055, 4056-4057, 4058-4059, 4060-4061, 4062-4063, 4064-4065, 4066-4067, 4068-4069, 4070-4071, 4072-4073, 4074-4075, 4076-4077, 4078-4079, 4080-4081, 4082-4083, 4084-4085, 4086-4087, 4088-4089, 4090-4091, 4092-4093, 4094-4095, 4096-4097, 4098-4099, 4100-4101, 4102-4103, 4104-4105, 4106-4107, 4108-4109, 4110-4111, 4112-4113, 4114-4115, 4116-4117, 4118-4119, 4120-4121, 4122-4123, 4124-4125, 4126-4127, 4128-4129, 4130-4131, 4132-4133, 4134-4135, 4136-4137, 4138-4139, 4140-4141, 4142-414
```

12.



A screenshot of a gedit text editor window titled '\*Makefile (/usr/src/linux-4.15.1/helloworld) - gedit'. The editor shows a single line of code: `obj-y := helloworld.o`. The status bar at the bottom indicates 'Ln 1, Col 22' and 'INS'.

13. Updating Roll no (19.02.59)



A screenshot of a gedit text editor window titled '\*Makefile (/usr/src/linux-4.15.1) - gedit'. The editor shows a multi-line Makefile with various configuration and documentation comments. The status bar at the bottom indicates 'Ln 4, Col 14' and 'INS'.

```
# SPDX-License-Identifier: GPL-2.0
VERSION = 19
PATCHLEVEL = 02
SUBLEVEL = 59
EXTRAVERSION =
NAME = Fearless Coyote

# *DOCUMENTATION*
# To see a list of typical targets execute "make help"
# More info can be located in ./README
# Comments in this file are targeted only to the developer, do not
# expect to learn how to build the kernel reading this file.

# That's our default target when none is given on the command line
PHONY := _all
_all:

# o Do not use make's built-in rules and variables
# (this increases performance and avoids hard-to-debug behaviour);
# o Look for make include files relative to root of kernel src
MAKEFLAGS += -rB --include-dir=$(CURDIR)

# Avoid funny character set dependencies
unexport LC_ALL
LC_COLLATE=C
LC_NUMERIC=C
export LC_COLLATE LC_NUMERIC

# Avoid interference with shell env settings
unexport GREP_OPTIONS

# We are using a recursive build, so we need to do a little thinking
# to get the ordering right.
#
```

```

root@k190259-VirtualBox: /usr/src/linux-4.15.1/arch/x86/entry/syscalls
root@k190259-VirtualBox: /usr/src/linux-4.15.1/arch/x86/entry/syscalls# cd arch/x86/entry/syscalls
root@k190259-VirtualBox: /usr/src/linux-4.15.1/arch/x86/entry/syscalls# ls
Makefile  syscall_32.tbl  syscall_64.tbl  syscallhdr.sh  syscalltbl.sh
root@k190259-VirtualBox: /usr/src/linux-4.15.1/arch/x86/entry/syscalls# gedit syscall_64.tbl

(gedit:7436): Gtk-WARNING **: Calling inhibit failed: GDBus.Error:org.freedesktop.DBus.Error.ServiceUnknown: The name org.gnome.SessionManager is not provided by any .service files

** (gedit:7436): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-spell-enabled not supported

** (gedit:7436): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-encoding not supported

** (gedit:7436): WARNING **: Set document metadata failed: Setting attribute metadata:gedit-position not supported
root@k190259-VirtualBox: /usr/src/linux-4.15.1/arch/x86/entry/syscalls#

```

```
syscall_64.tbl /usr/src/linux-4.15.1/arch/x86/entry/syscalls - gedit
Open [R]
syscall_64.tbl
/usr/src/linux-4.15.1/arch/x86/entry/syscalls

304 common open_by_handle_at sys_open_by_handle_at
305 common clock_adjtime sys_clock_adjtime
306 common syncfs sys_syncfs
307 64 sendmsg sys_sendmsg
308 common setns sys_setns
309 common getcpu sys_getcpu
310 64 process_vm_readv sys_process_vm_readv
311 64 process_vm_writev sys_process_vm_writev
312 common kcmp sys_kcmp
313 common finit_module sys_finit_module
314 common sched_setattr sys_sched_setattr
315 common sched_getattr sys_sched_getattr
316 common renameat2 sys_renameat2
317 common seccomp sys_seccomp
318 common getrandom sys_getrandom
319 common memfd_create sys_memfd_create
320 common kexec_file_load sys_kexec_file_load
321 common bpf sys_bpf
322 64 execveat sys_execveat/ptrags
323 common userfaultfd sys_userfaultfd
324 common mknod sys_mknod
325 common mlock2 sys_mlock2
326 common copy_file_range sys_copy_file_range
327 64 preadv2 sys_preadv2
328 64 pwritev2 sys_pwritev2
329 common pkey_mprotect sys_pkey_mprotect
330 common pkey_alloc sys_pkey_alloc
331 common pkey_free sys_pkey_free
332 common statx sys_statx
333 64 helloworld sys_helloworld

#
# x32-specific system call numbers start at 512 to avoid cache impact
#
Saving file '/usr/src/linux-4.15.1/arch/x86/entry/syscalls/syscall_64.tbl' ...
Plain Text Tab width: 8 Ln 342, Col 41 INS
```



## 16. Menuconfig and oldconfig

```
root@k190259-VirtualBox: /usr/src/linux-4.15.1
root@k190259-VirtualBox: /usr/src/linux-4.15.1/arch/x86/entry/syscalls# cd ../../../../
root@k190259-VirtualBox: /usr/src/linux-4.15.1# make menuconfig
scripts/kconfig/mconf Kconfig

*** End of the configuration.
*** Execute 'make' to start the build or try 'make help'.

root@k190259-VirtualBox: /usr/src/linux-4.15.1# make oldconfig
HOSTCC scripts/kconfig/conf.o
HOSTLD scripts/kconfig/conf
scripts/kconfig/conf --oldconfig Kconfig
#
# configuration written to .config
#
root@k190259-VirtualBox: /usr/src/linux-4.15.1#
```

## 17.

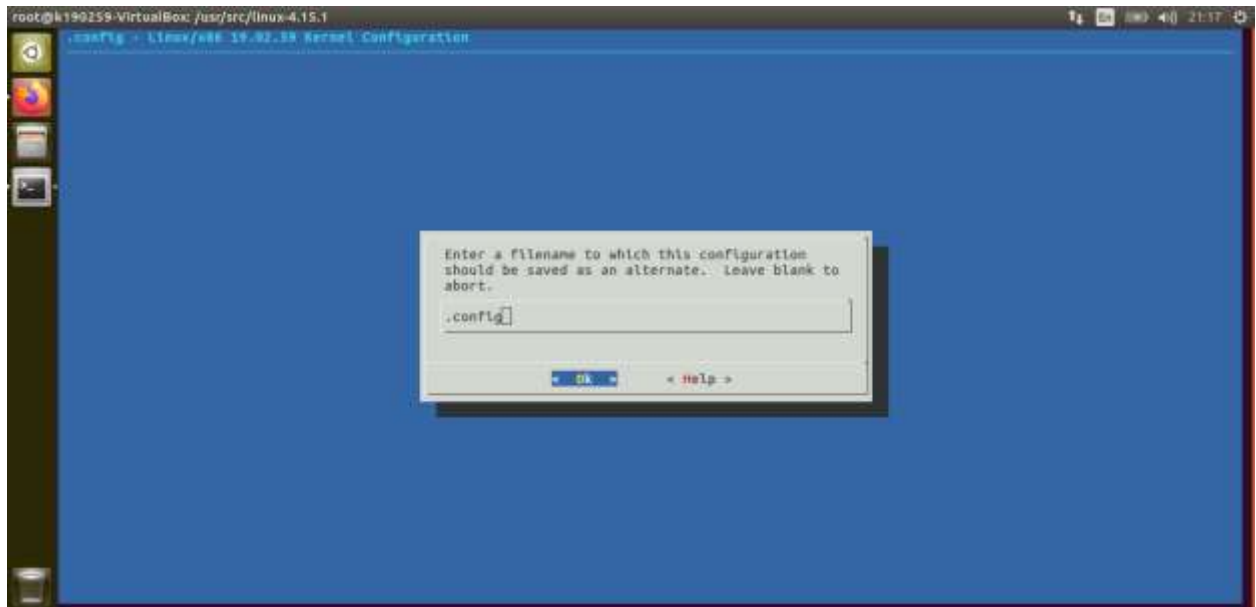
```
root@k190259-VirtualBox: /usr/src/linux-4.15.1
config - Linux/x86_64 4.15.1 Kernel Configuration

Linux/x86_64 4.15.1 Kernel Configuration
Arrow keys navigate the menu. <Enter> selects submenus --- (or empty submenu ---). Highlighted letters are hotkeys. Pressing <Y>
includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ]
excluded <M> module < > module capable

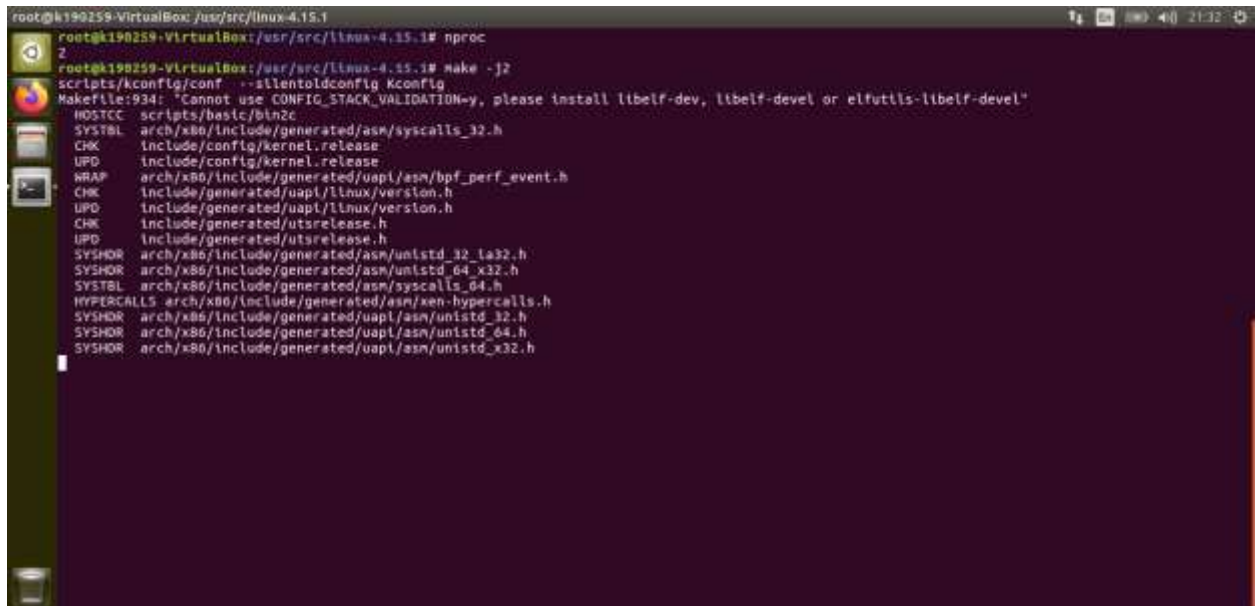
[*] 64-bit kernel
  General setup --->
  [*] enable loadable module support --->
  [*] enable the block layer --->
  Processor type and features --->
  Power management and ACPI options --->
  Bus options (PCI etc.) --->
  Executable file formats / Emulations --->
  [*] Networking support --->
    Device Drivers --->
    Firmware Drivers --->
    File systems --->
    Kernel hacking --->
    Security options --->
    Cryptographic API --->
  [*] Virtualization --->
    Library routines --->

<Select> < Exit > < Help > < Save > < Load >
```

18.



19. Downloading kernel (takes almost 8 hours)



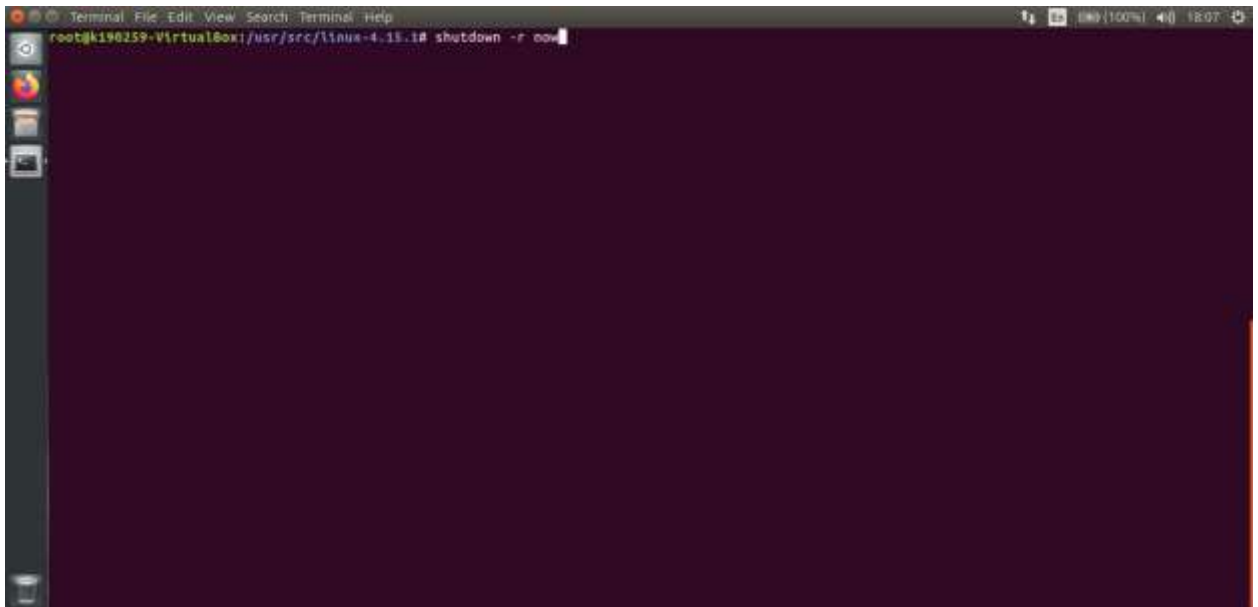
## 20. Making old modules

```
LD [H] sound/usb/usx2y/snd-usb-us122l.ko
LD [H] sound/usb/usx2y/snd-usb-usx2y.ko
LD [H] sound/x86/snd-hdmi-lpe-audio.ko
LD [H] virt/lib/lrqbypass.ko
root@kali190259-VirtualBox: /usr/src/linux-4.15.10
root@kali190259-VirtualBox: /usr/src/linux-4.15.10# make modules_install install
INSTALL arch/x86/crypto/aes-x86_64.ko
INSTALL arch/x86/crypto/aesni-intel.ko
INSTALL arch/x86/crypto/blowfish-x86_64.ko
INSTALL arch/x86/crypto/camellia-aesni-avx-x86_64.ko
INSTALL arch/x86/crypto/camellia-aesni-avx2.ko
INSTALL arch/x86/crypto/camellia-x86_64.ko
INSTALL arch/x86/crypto/cast5-avx-x86_64.ko
INSTALL arch/x86/crypto/cast5-avx-x86_64.ko
INSTALL arch/x86/crypto/chacha20-x86_64.ko
INSTALL arch/x86/crypto/crc32-pclmul.ko
INSTALL arch/x86/crypto/crc32pclmul.ko
INSTALL arch/x86/crypto/des3-ede-x86_64.ko
INSTALL arch/x86/crypto/ghash-clmul-intel.ko
INSTALL arch/x86/crypto/glue_helper.ko
INSTALL arch/x86/crypto/poly1305-x86_64.ko
INSTALL arch/x86/crypto/serpent-avx-x86_64.ko
INSTALL arch/x86/crypto/serpent-avx2.ko
INSTALL arch/x86/crypto/serpent-sse2-x86_64.ko
INSTALL arch/x86/crypto/sha1-nb/sha1-nb.ko
INSTALL arch/x86/crypto/sha1-ssse3.ko
INSTALL arch/x86/crypto/sha256-nb/sha256-nb.ko
INSTALL arch/x86/crypto/sha256-ssse3.ko
INSTALL arch/x86/crypto/sha512-nb/sha512-nb.ko
INSTALL arch/x86/crypto/sha512-ssse3.ko
INSTALL arch/x86/crypto/twofish-avx-x86_64.ko
INSTALL arch/x86/crypto/twofish-x86_64-3way.ko
INSTALL arch/x86/crypto/twofish-x86_64.ko
INSTALL arch/x86/events/intel/intel-cstate.ko
INSTALL arch/x86/events/intel/intel-rapl-perf.ko
INSTALL arch/x86/kernel/cpu/mcheck/mce-inject.ko
INSTALL arch/x86/kernel/cputd.ko
```

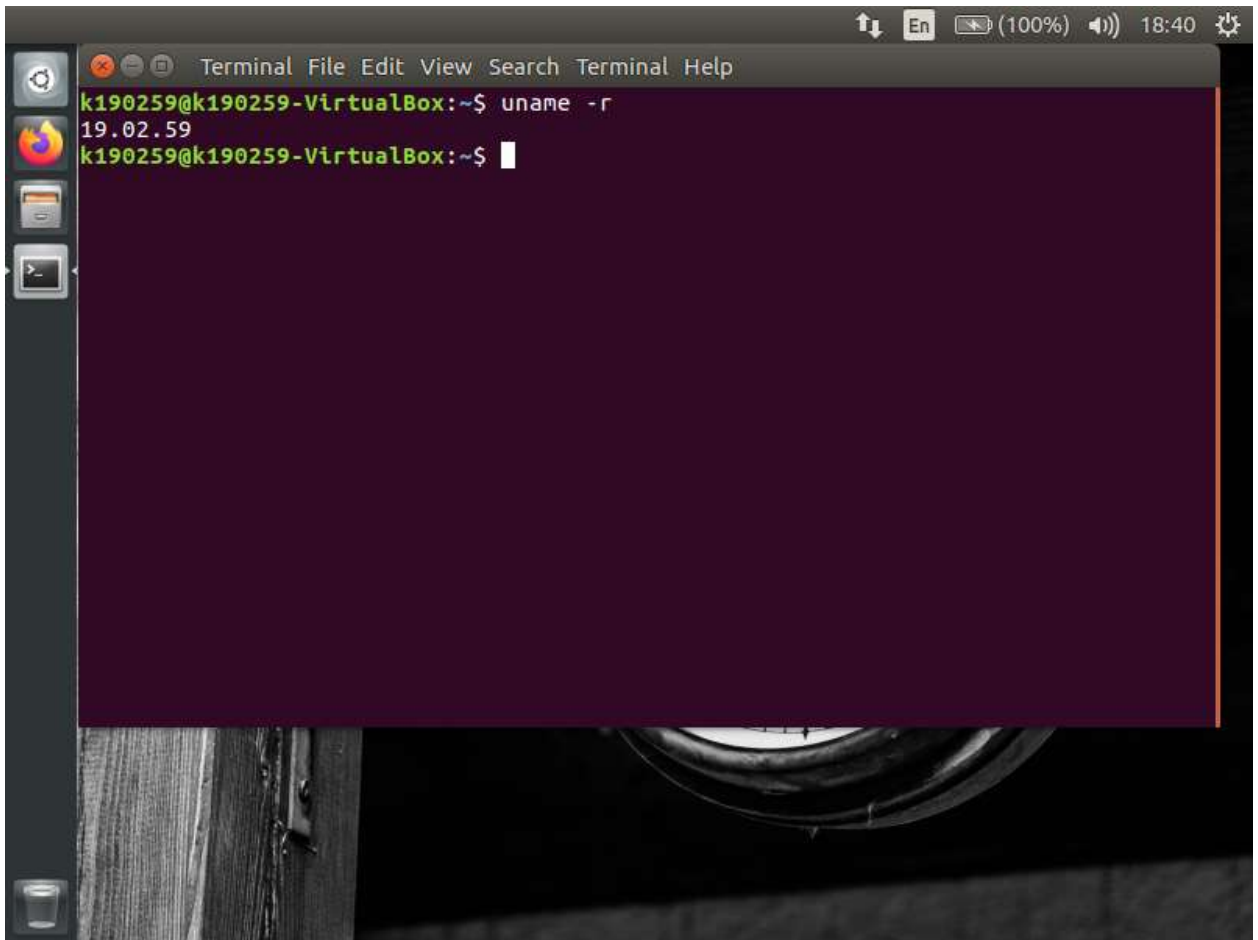
## 21. Modules got done

```
INSTALL sound/usb/l16m/snd-usb-podhd.ko
INSTALL sound/usb/l16m/snd-usb-toneport.ko
INSTALL sound/usb/l16m/snd-usb-varlat.ko
INSTALL sound/usb/misc/snd-usb101.ko
INSTALL sound/usb/snd-usb-audio.ko
INSTALL sound/usb/snd-usbmidi-lib.ko
INSTALL sound/usb/usx2y/snd-usb-us122l.ko
INSTALL sound/usb/usx2y/snd-usb-usx2y.ko
INSTALL sound/x86/snd-hdmi-lpe-audio.ko
INSTALL virt/lib/lrqbypass.ko
DEPMOD 19.02.59
sh ./arch/x86/boot/install.sh 19.02.59 arch/x86/boot/bzImage \
System.map "/boot"
run-parts: executing /etc/kernel/postinst.d/apt-auto-removal 19.02.59 /boot/vmlinuz-19.02.59
run-parts: executing /etc/kernel/postinst.d/initramfs-tools 19.02.59 /boot/vmlinuz-19.02.59
update-initramfs: Generating /boot/initrd.img-19.02.59
run-parts: executing /etc/kernel/postinst.d/pm-utils 19.02.59 /boot/vmlinuz-19.02.59
run-parts: executing /etc/kernel/postinst.d/unattended-upgrades 19.02.59 /boot/vmlinuz-19.02.59
run-parts: executing /etc/kernel/postinst.d/update-notifier 19.02.59 /boot/vmlinuz-19.02.59
run-parts: executing /etc/kernel/postinst.d/vboxadd 19.02.59 /boot/vmlinuz-19.02.59
VirtualBox Guest Additions: Building the modules for kernel 19.02.59.
VirtualBox Guest Additions: look at /var/log/vboxadd-setup.log to find out what
went wrong
run-parts: executing /etc/kernel/postinst.d/zz-update-grub 19.02.59 /boot/vmlinuz-19.02.59
Generating grub configuration file ...
Warning: Setting GRUB_TIMEOUT to a non-zero value when GRUB_HIDDEN_TIMEOUT is set is no longer supported.
Found linux image: /boot/vmlinuz-19.02.59
Found initrd image: /boot/initrd.img-19.02.59
Found linux image: /boot/vmlinuz-4.15.0-112-generic
Found initrd image: /boot/initrd.img-4.15.0-112-generic
Found linux image: /boot/vmlinuz-4.4.0-206-generic
Found initrd image: /boot/initrd.img-4.4.0-206-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
root@kali190259-VirtualBox: /usr/src/linux-4.15.10
```

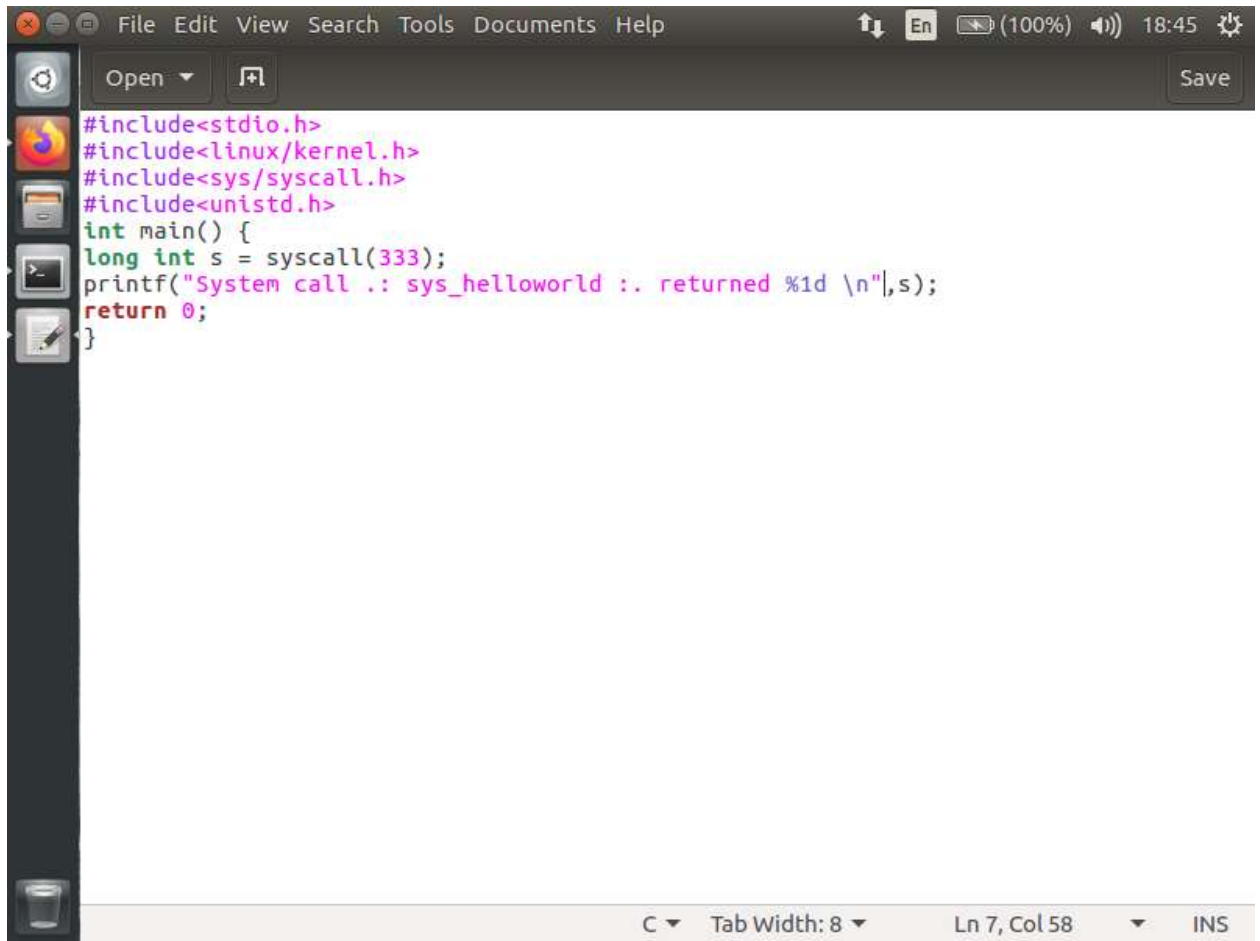
## 22. Shutdown the system and restarted



## 23. Version updated, (19.02.59) old one was (4.15.0)



## 24. System call file.



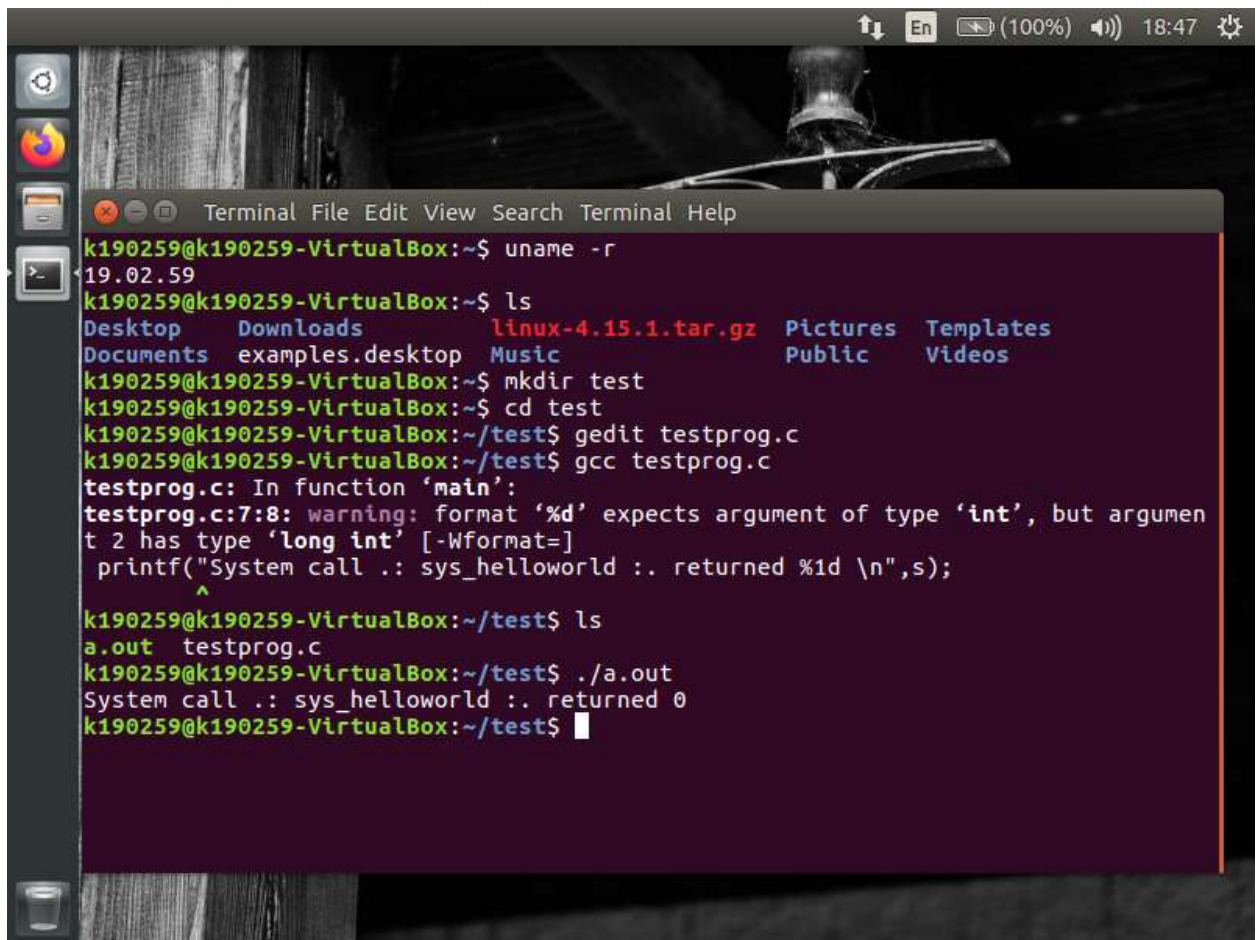
The image shows a screenshot of a code editor window. The window has a dark theme and a menu bar with options: File, Edit, View, Search, Tools, Documents, and Help. On the right side of the menu bar, there are icons for undo, redo, a language mode dropdown set to 'En', a zoom level indicator at '(100%)', a speaker icon for audio, and a clock showing '18:45'. Below the menu bar is a toolbar with an 'Open' button and a '+1' icon. On the left side of the editor, there is a vertical sidebar with icons for a file explorer, a search engine, a terminal, and a debugger. The main area of the editor contains the following C code:

```
#include<stdio.h>
#include<linux/kernel.h>
#include<sys/syscall.h>
#include<unistd.h>
int main() {
    long int s = syscall(333);
    printf("System call .: sys_helloworld .: returned %1d \n",s);
    return 0;
}
```

At the bottom of the window, there is a status bar showing 'C' as the current language, 'Tab Width: 8', 'Ln 7, Col 58', and 'INS' as the current input mode.

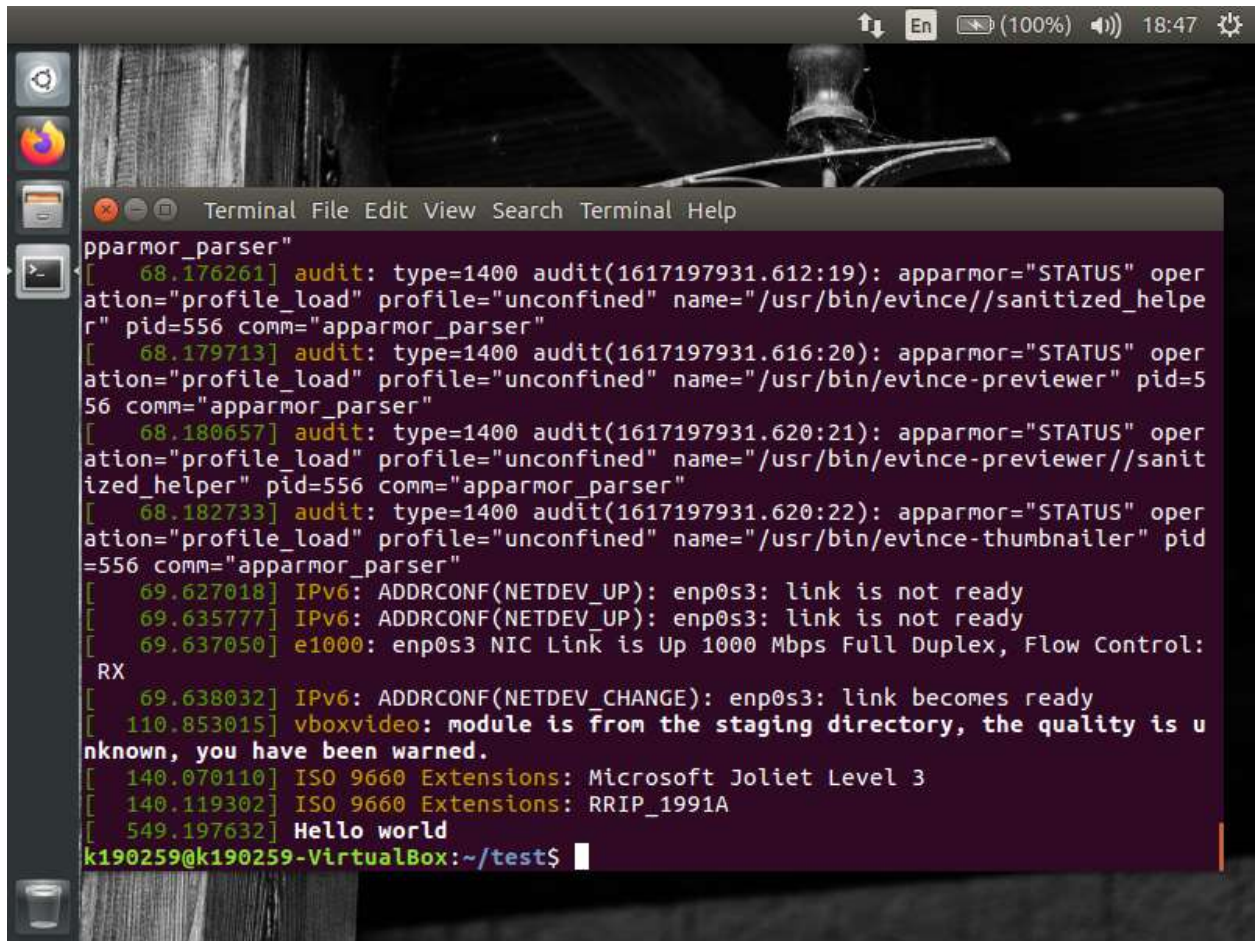


## 25. Making .exe file for system call's file



```
k190259@k190259-VirtualBox:~$ uname -r
19.02.59
k190259@k190259-VirtualBox:~$ ls
Desktop  Downloads  linux-4.15.1.tar.gz  Pictures  Templates
Documents  examples.desktop  Music  Public  Videos
k190259@k190259-VirtualBox:~$ mkdir test
k190259@k190259-VirtualBox:~$ cd test
k190259@k190259-VirtualBox:~/test$ gedit testprog.c
k190259@k190259-VirtualBox:~/test$ gcc testprog.c
testprog.c: In function 'main':
testprog.c:7:8: warning: format '%d' expects argument of type 'int', but argumen
t 2 has type 'long int' [-Wformat=]
printf("System call .: sys_helloworld .: returned %1d \n",s);
^
k190259@k190259-VirtualBox:~/test$ ls
a.out  testprog.c
k190259@k190259-VirtualBox:~/test$ ./a.out
System call .: sys_helloworld .: returned 0
k190259@k190259-VirtualBox:~/test$
```

## 26. Printing Hello World.



The screenshot shows a Linux desktop environment with a terminal window open. The terminal displays a series of system logs, including audit messages and network status updates. The logs show the execution of 'apparmor\_parser' and the loading of profiles for 'evince//sanitized\_helper', 'evince-previewer', and 'evince-thumbnailer'. It also shows the network interface 'enp0s3' becoming ready. Finally, the message 'Hello world' is printed to the terminal. The prompt at the bottom indicates the user is 'k190259' in a 'VirtualBox' environment, currently in the directory '~/test'.

```
pparmor_parser"
[ 68.176261] audit: type=1400 audit(1617197931.612:19): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/bin/evince//sanitized_helper" pid=556 comm="apparmor_parser"
[ 68.179713] audit: type=1400 audit(1617197931.616:20): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/bin/evince-previewer" pid=556 comm="apparmor_parser"
[ 68.180657] audit: type=1400 audit(1617197931.620:21): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/bin/evince-previewer//sanitized_helper" pid=556 comm="apparmor_parser"
[ 68.182733] audit: type=1400 audit(1617197931.620:22): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/bin/evince-thumbnailer" pid=556 comm="apparmor_parser"
[ 69.627018] IPv6: ADDRCONF(NETDEV_UP): enp0s3: link is not ready
[ 69.635777] IPv6: ADDRCONF(NETDEV_UP): enp0s3: link is not ready
[ 69.637050] e1000: enp0s3 NIC Link is Up 1000 Mbps Full Duplex, Flow Control: RX
[ 69.638032] IPv6: ADDRCONF(NETDEV_CHANGE): enp0s3: link becomes ready
[ 110.853015] vboxvideo: module is from the staging directory, the quality is unknown, you have been warned.
[ 140.070110] ISO 9660 Extensions: Microsoft Joliet Level 3
[ 140.119302] ISO 9660 Extensions: RRIP_1991A
[ 549.197632] Hello world
k190259@k190259-VirtualBox:~/test$
```

After a great struggle, hard work and solving so many errors,  
Alhamdulillah done with the Hello World system call assignment.