Session 1 exercise

Download and save locally. When completing the exercise, please mail it to adva@mercantec.dk

WLAN windows 7/8

Let's examine your windows 7/8 laptop WLAN capabilities. Open a commando prompt as administrator, and issue the *netshell* command shown in Figure 1.

| an Administrator: Windows Kommandolinjefortolker | | |
|---|---|--|
| C:\Windows\System32>netsh wlan show interfaces | | |
| Der er 1 grænseflade på computeren: | | |
| Navn Beskrivelse GUID Fysisk adresse Tilstand | : Trådløs netværksforbindelse : Intel(R) Centrino(R) Ultimate-N 6300 AGN : 676eeed6-b42c-4b93-8d53-0c87dc522195 : 24:77:03:70:da:e0 : forbindelsen er afbrudt | |
| Status for værtsbaseret netværk : Ikke startet | | |

Figure 1 - Wireless interface on writer's computer. Text is in Danish

The interface in the example is an Intel 6300 AGN which support 802.11a, 802.11b, 802.11g and 802.11n. There are a 2,4 GHz radio supporting 802.11b/g/n and a 5 GHz radio supporting 802.11a/n. Many "cheap" WLAN interfaces only support 802.11b, 802.11g and 802.11n using a 2,4 GHz radio.

Which WLAN interface is embedded in your computer?

Which 802.11 standards does your WLAN interface support? It might be necessary to "google" your adapter to get the vendors specifications.

WLAN interface driver

Misbehaving WLAN interfaces often need a driver software update. Or even in some cases a software downgrade. You can see the driver version using *netsh wlan show driver* or by showing the properties of your WLAN interface.

Which driver version is installed on your WLAN interface?

| genskaber for Intel(R) Centrino(R) Ultimate-N 6300 AGN | | | |
|---|--|--|--|
| Generelt Avanceret Driver Detaljer Strømstyring | | | |
| Intel(R) Centrino(R) Ultimate-N 6300 AGN | | | |
| Driverproducent Intel | | | |
| Dato for driver: 19-01-2011 | | | |
| Driverversion: 13.5.0.6 | | | |
| Digital underskriver: Microsoft Windows Hardware Compatibility | | | |
| Driverdetaljer Viser detaljer om driverfilerne. | | | |
| Opdater driver Opdaterer driversoftwaren til denne enhed. | | | |
| Annuller opdateringen og vender tilbage til den tidligere installerede driver, hvis enheden ikke virker efter opdateringen. | | | |
| Deaktiver Deaktiverer den valgte enhed. | | | |
| Fjerm Fjermer driveren (Avanceret). | | | |
| OK Annuller | | | |

Figure 2 - WLAN interface properties

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Windows Profiles

Using the netshell command "netsh wlan show profiles" you can see which WLAN's you have been connected to.

To see a specific profile and the secret key in clear text use *'netsh wlan show profile name="SSID_NAME" key=clear'* command. Same information is available in windows WLAN management.

Windows signal strength

The signal strength offered by Windows is not that detailed.

To see a detailed list of nearby access point use the *'netsh wlan show networks mode=bssid'* command as seen below.

| Trådløs netværksforbind | else 🔺 | |
|-------------------------|------------|---|
| BHL | Tilsluttet | |
| CorpA | llee. | |
| HomeBox-80F9 | ألاده | |
| TDC-TV-088C | lite. | = |
| Falck_Pedersen | للدو | |
| TDC-E47C | | |
| TDC-BB2C | | * |

Figure 3 - Windows WLAN locater

| Administrator: Windows Kommandolinjefortolker |
|---|
| C:\Users\heth\Downloads>netsh wlan show networks mode=bssid |
| Interface : Wireless network connection |
| SSID 1 : HomeBox-80F9 Networktype : Infrastruktur |
| Encryption : CCMP |
| BSSID 1 : 7c:03:4c:d4:80:ff |
| Signal strength : 71% |
| Radio type : 802.11n |
| Channel : II Basic data rates (Mbps) : 1 2 5 5 11 |
| Other data rates (Mbps) : 6 9 12 18 24 36 48 54 |

Figure 4 - detailed view of nearby access points.

The access point shown in Figure 4 shows a signal strength of 71%. Microsoft – like most vendors – do not show signal strength directly in dBm but as a percentage. 0% = -100 dBm and 100% = -50 dBm

71% signal strength corresponds to $-100 \ dBm + \frac{71\%}{2\%/dBm} = -100 \ dBm + 35,5 \ dBm = -64,5 \ dBm$

What is the signal strength in percent and dBm of the Wireless network you are associated to?

Ascom Wi-Fi

Windows data rate

Because a WLAN offers high data rates doesn't mean you are connected at a high data rate. Your WLAN interface uses lower and lower data rates as the signal strength decreases. To see the actual data rate your WLAN interface use to connect to the access point, you can use the *'status for Wireless connection'* window. Remember the connected data rate is not equal to the actual data transfer, as your WLAN interface has to share the frequency with all other radios, using the same channels.

My WLAN interface connected with 144 Mbps to my access point with 92% signal strength. As I moved my laptop further and further away from the access point it dropped down through the data rates until it reached 1 Mbps. Then it lost connection.

Which data rates and signal strengths does your adapter use as you increase the distance to your access point.

Estimate the distance and notice the effect of concrete walls or other objects in the path between your laptop and your access point.

Write down your notes below:

| ani Status for Trådløs | netværksforbindelse |
|------------------------|-------------------------|
| Generelt | |
| Forbindelse | |
| IPv4-forbindelse: | N Internet |
| IPv6-forbindelse: | ہم Ingen internetadgang |
| Medietilstand: | Aktiveret |
| SSID: | HomeBox-F000_2.4G |
| Varighed: | 1 dag 21:27:00 |
| Hastighed: | 1.0 Mbps |
| Signalstyrke: | لللته |
| Detaljer | Trådløse egenskaber |
| Aktivitet | |
| | Sendt — Modtaget |
| Byte: | 516.878 1.624.360 |
| | Deaktiver Diagnosticer |
| | Luk |

Figure 5 - Just before losing connection

Wireless survey and troubleshooting tools

There are numerous different WLAN survey and wireless troubleshooting tools on the marked. Some are free and others very expensive. There are tools for different purposes.

In this section you will explore which Wi-Fi tools you and your colleges use to make site surveys and troubleshooting. If you don't know the answer to some of the tools, you might have to ask a college.

Wi-Fi Network scanners

A network scanner is used to scan the Wi-Fi networks in the proximity of the device running the scanner such as a Laptop or a smartphone. The scanner often show signal strength 802.11 generation, data rates and authentication type.

| 😘 inSSIDer | | | | | | | |
|--|----------|-------------|-----------|----------|------------|----------|--|
| File View Wi-Fi Help | | | | | | | |
| Radio • ESSID FILTERS: SSID | M | IAC Address | Chann | el | Signal | | |
| ESSID | CHANNELS | SIGNAL (dB | BSSID COU | РНҮ ТҮРЕ | SECURITY T | MIN DATA | MAX DATA |
| BHL 🗢 | 11, 108* | -31 | 2 | b, g, n | • | 1.0 | 600.0 |
| HomeBox-80F9 | 11 | -53 | 1 | b, g, n | | 1.0 | 144.4 |
| Falck_Pedersen | 1* | -78 | 1 | b, g, n | A | 1.0 | 300.0 |
| CorpA | 6, 104 | -25 | 2 | a, b, g | <u></u> | 1.0 | 54.0 |
| TDC-TV-088C | 136* | -64 | 1 | n | a | 6.0 | 600.0 |
| TDC-BB2C | 5 | -82 | 1 | b, g, n | a | 1.0 | 130.0 |
| TDC-E47C | 6 | -88 | 1 | b, g, n | | 1.0 | 130.0 |
| NETGEARHOME | 7 | -86 | 1 | b, g, n | A | 1.0 | 144.4 |
| 2.4 GHz | 5 GH; | z | | | | | |
| -30 -40 -50 -60 -70 Falck palansen NETGEARHOME -90 -80 -90 -10 -10 -10 -10 -10 -10 -10 -1 |] | th 50 c0 | | CorpA | |)88C | 30 40 50 60 70 80 90 |
| 123456789 11 13 | 36 4 | 4 52 60 | | 100 112 | 2 124 136 | 149 16 | 1 |

Figure 6 - inSSIDer a very popular Wi-Fi scanner, showing Wi-Fi networks, channels and signal strength in dBm

Which Wi-Fi scanner(s) do you and/or Ascom use: ____

Wi-Fi network sniffers

A network sniffer or packet capture program is a program that sniffs packets from one or more Wi-Fi channels for analysis. Many network sniffers need one or more dedicated Wi-Fi interface adapters to capture the raw radio frames. Popular sniffers are Wireshark, Commview and Eye P.A.

| WH/L2.pcapng [Wiresnark 1.12.0 (V1.12.0-0-g4tab41a from master-1.12)] | | | | | |
|--|---------------------------------|--|--|--|--|
| Elle Edit <u>View Go</u> Capture <u>A</u> nalyze <u>S</u> tatistics Telephony Iools Internals <u>H</u> elp | | | | | |
| ● ● ∡ ■ ½ 🖻 🖹 X 😂 °, ÷ ÷ ⇒ ∓ ½ 🗐 🗐 °, °, °, © 🕷 🗵 🥵 💥 📴 | | | | | |
| Filter: Expre | sion Clear Apply Save New Label | | | | |
| lo. Time Source | Destination | Protocol Length Info | | | |
| 1 12:01:59.139965000 d2:ae:ec:47:88: | 39 Broadcast | 802.11 1423 QoS Null function (No data)[Malf | | | |
| 2 12:01:59.258908000 00:19:70:44:69: | le Broadcast | 802.11 1416 Beacon frame, SN=3728, FN=0, Fla | | | |
| 3 12:01:59.387884000 94:44:52:d9:c7: | 09 Broadcast | 802.11 1400 Beacon frame, SN=430, FN=0, Flag | | | |
| 4 12:01:59.554952000 d2:ae:ec:47:88: | 39 Broadcast | 802.11 1360 Beacon frame, SN=804, FN=0, Flag | | | |
| 5 12:01:59.669388000 24:77:03:70:da: | eO Broadcast | 802.11 1211 Probe Request, SN=3149, FN=0, F1 | | | |
| 6 12:01:59.678943000 00:19:70:44:69: | 1e 24:77:03:70:da:e0 | 802.11 1288 Acknowledgement, Flags= | | | |
| 7 12:01:59.707100000 24:77:03:70:da: | eO Broadcast | 802.11 1178 Probe Request, SN=3152, FN=0, F7 | | | |
| 8 12:01:59.710375000 00:19:70:44:69: | le 24:77:03:70:da:e0 | 802.11 1250 Acknowledgement, Flags= | | | |
| 9 12:01:59.740099000 d2:ae:ec:47:88: | 39 24:77:03:70:da:e0 | 802.11 1259 Acknowledgement, Flags= | | | |
| 10 12:01:59.749083000 94:44:52:d9:c7: | 09 24:77:03:70:da:e0 | 802.11 980 Probe Response, SN=2387, FN=0, F | | | |
| 11 12:01:59.759744000 94:44:52:d9:c7: | 09 24:77:03:70:da:e0 | 802.11 1202 Acknowledgement, Flags= | | | |
| 12 12:01:59.770408000 00:19:70:44:69: | le Broadcast | 802.11 375 Beacon frame, SN=3733, FN=0, Fla | | | |
| 13 12.01.59 773428000 48.44.87.cd.82. | R9 TDV/Amcast 7f.ff.fa | 802 11 1407 Data SN-1715 EN-0 Flags- pm | | | |

Figure 7 – Analysing captured Wi-Fi traffic with Wireshark

Which Wi-Fi sniffer(s) do you and/or Ascom use: ____

Spectrum analysers

When troubleshooting poor performance on a Wi-Fi network a Spectrum Analyser is a great tool locating radio noise sources interrupting Wi-Fi communication. There are several popular spectrum analysers on the marked.



Figure 8 - The spectrum analyzer "Chanalyzer" show spectrum from 2,4 GHz to 2,5 GHz indicating signal levels in dBm

Which spectrum analyser(s) do you and/or Ascom use: ____

Site survey tools

When planning a major Wi-Fi network site survey tools are used on-site to plan for access point coverage. There are several site survey tools.



Figure 9 - Ekahau Site Survey tool showing access point coverage.

Which Wi-Fi site survey tool(s) do you and/or Ascom use: ____

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