

# COMMON TOOLS TO BREAK AND FIX WIRELESS PROTOCOLS

Why WEP and WPA is bad and why you should use WPA2  
(for now)



# INTRODUCTION

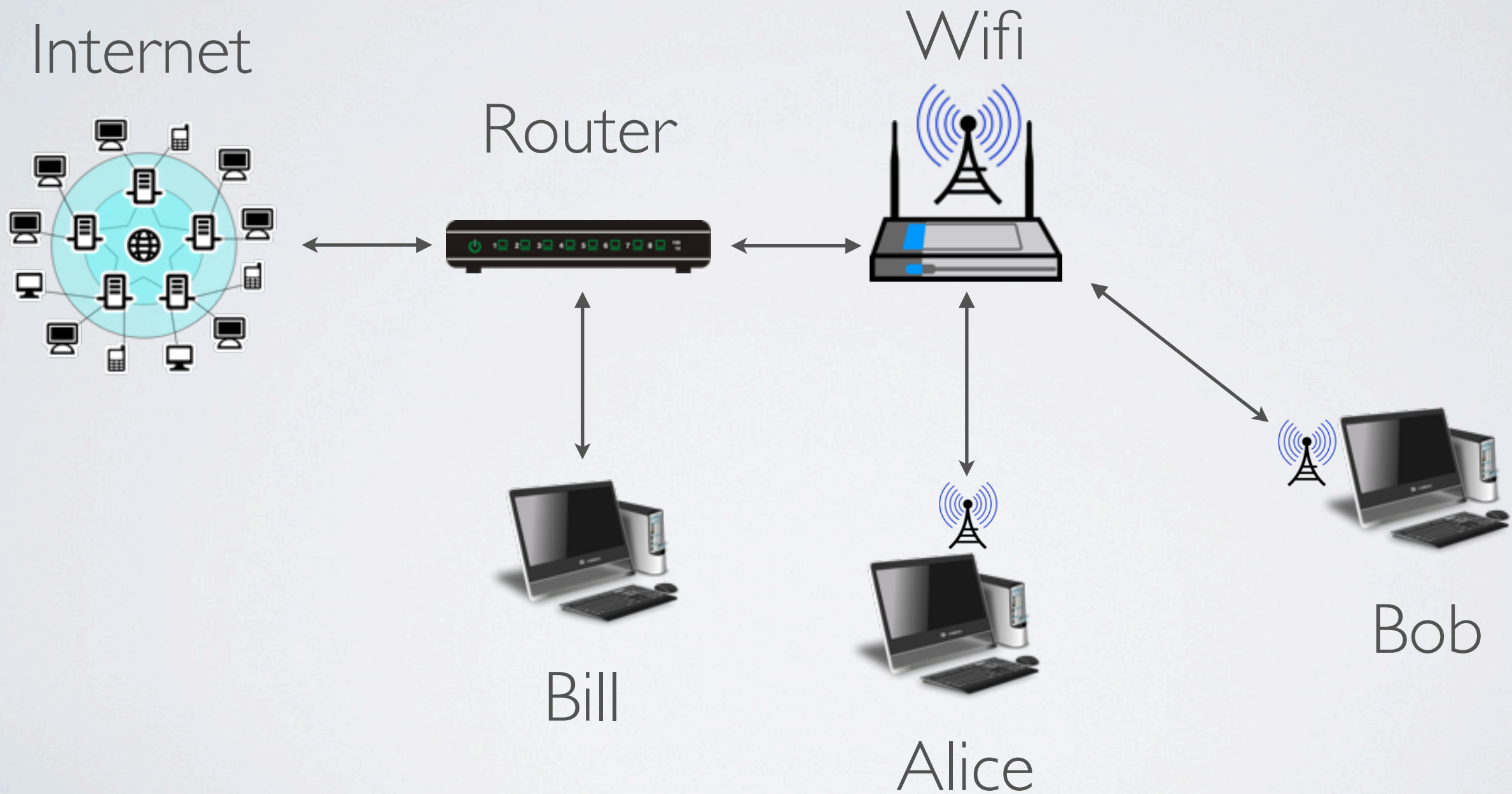
I.E. Why should I care?



# INTRODUCTION

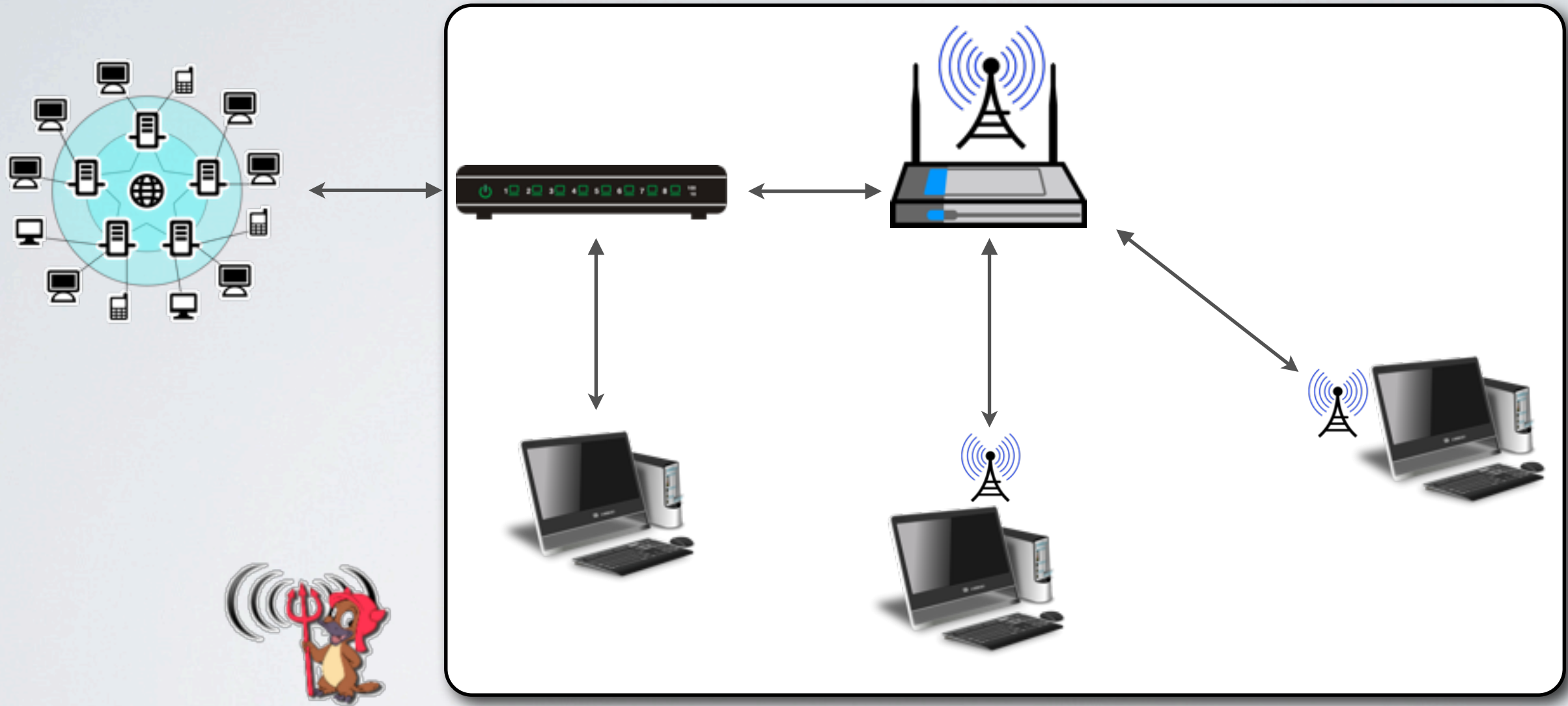
- People use wireless protocols and encryption everyday to use laptops, cell phones, and other wireless enabled devices.
- We “broadcast” our information over the air and anyone with special software can intercept this information.
- The network itself may be in danger if the encryption is broken.

# TYPICAL HOME NETWORK TOPOLOGY





# If the network security was cracked, what is compromised?



# WIFI ENCRYPTION

- Encrypting any traffic sent between any wifi device.
- Most common Protocols:
  - WEP - **Wired Equivalent Privacy**
  - WPA - **Wi-Fi Protected Access**
  - WPA2 - **Wi-Fi Protected Access 2**

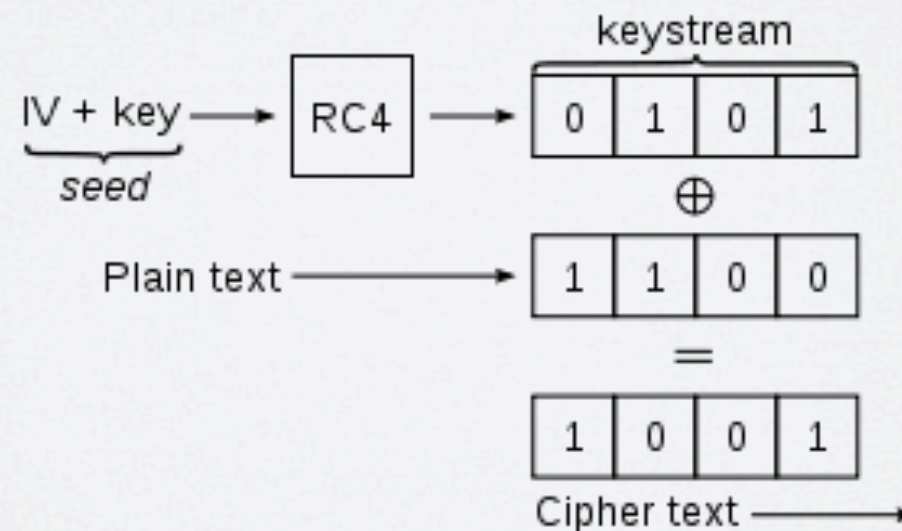


# EASY TO CRACK: WEP

- WEP is now susceptible to many attacks.
- Interception of wireless packets. Records all traffic to and from a set of computers that use the WEP protocol.
- The more active the network is, the more susceptible the network.
- Attacker can also use packet injection to stimulate the network.

# KNOWN VULNERABILITIES TO

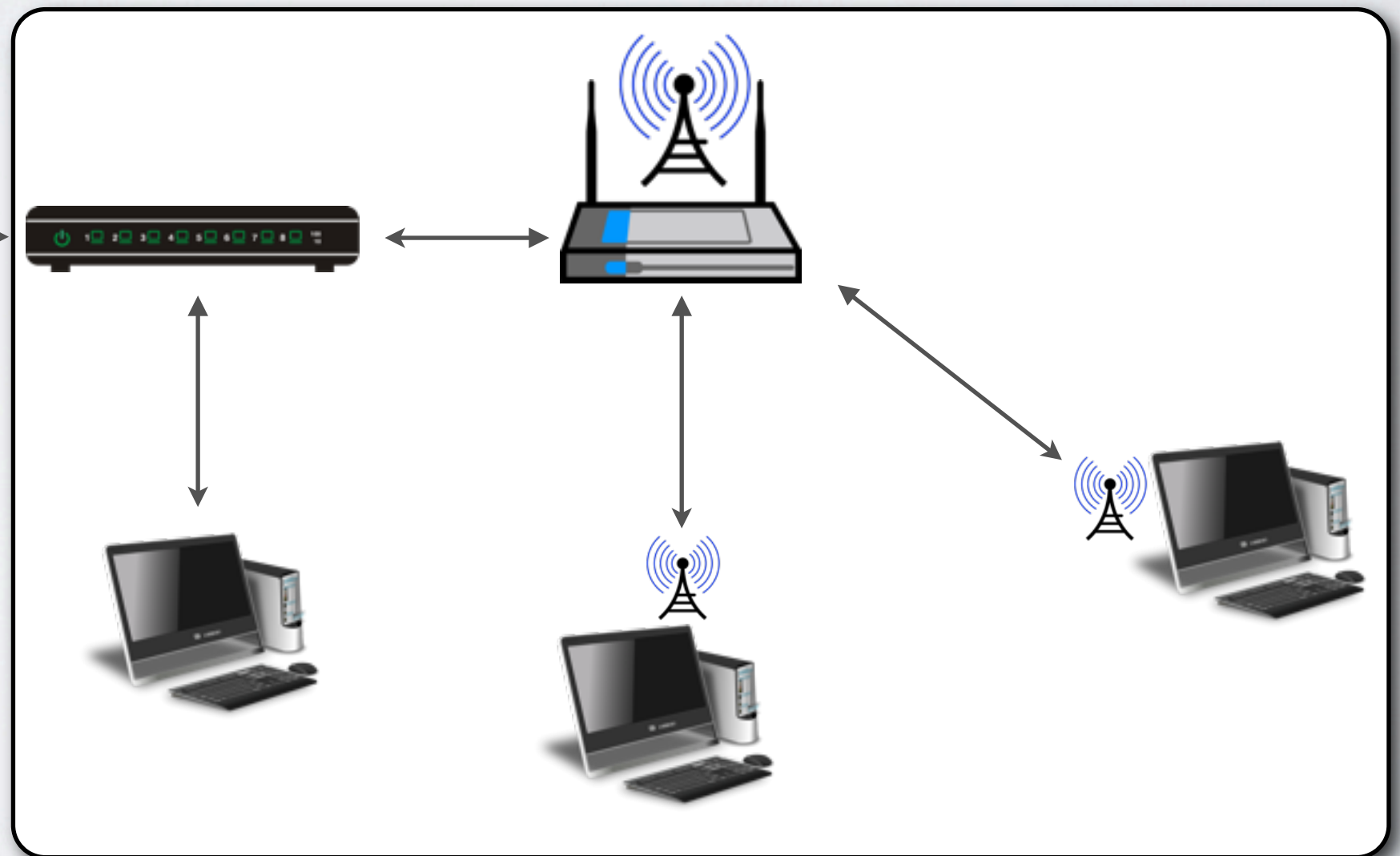
- WEP uses a nonce from the RC4 algorithm.
- IV creates a pseudo random initialization vector of 24 bits for the RC4 Algorithm.
- Problem: RC4 needs a unique nonce to work properly. WEP does not allocate enough bits for nonce, which means it reuses the nonce.



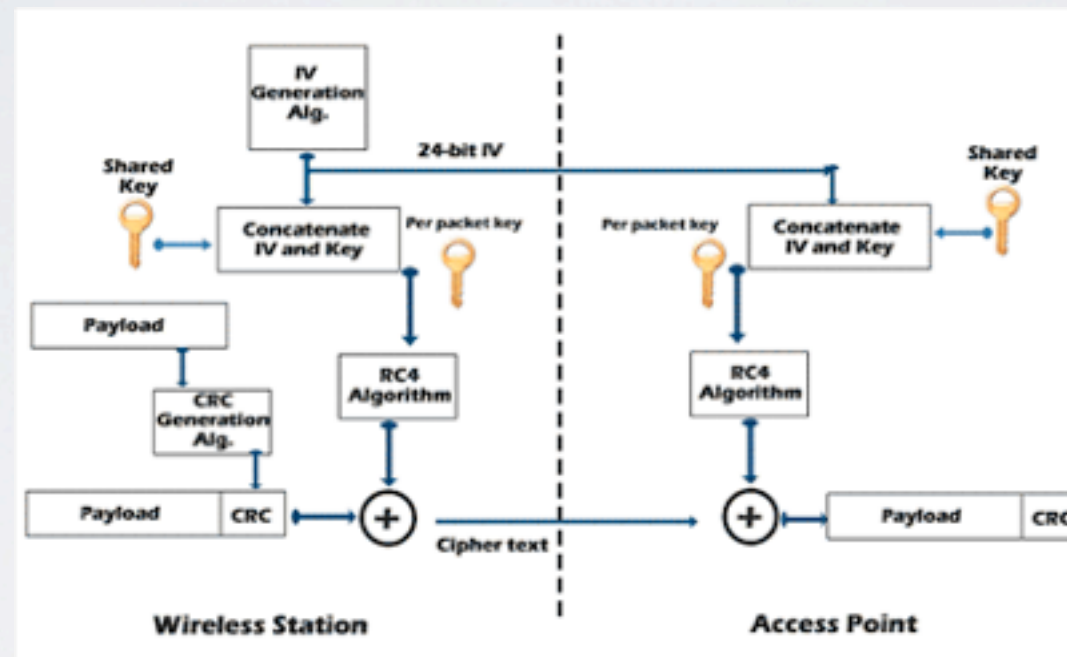


# SHARED KEY FLAW

- All computers have a shared key. If the key is compromised, traffic from the router to the other computers could be decrypted as well (as long as no other underlining encryption is occurring).



# OVERALL PICTURE





# TOOLS USED TO CRACK WEP

- **DEMO: KisMAC (Mac) - Mac tool used in this Demo.**
- **Backtrack 4 (Linux) - Linux distribution that includes tools for wireless security auditing.**
- **Aircrack (Windows) - Windows toolset for wireless auditing.**
- **All three of these tools can be used to crack WEP and WPA.**



# PASSIVE PACKET SNIFFING

- Wireless sniffer - A program that will look at all traffic in the area, even hidden Wifi signals. Will also record information such as data packets and management packets.
- Data packets contain unique IV's in the WEP.
- When enough (over 100,000) of these unique IV's are collected, known attacks such as the "Weak Scheduling attack" for 40 and 104 bit WEP encryption can be run.
- Can take a long time but works with almost any hardware.

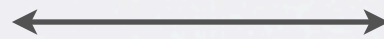


# DEMO WEP CRACKING

- I will be using KisMAC to demonstrate how an attacker might gain control of a system with WEP Wifi encryption.



Server



Client



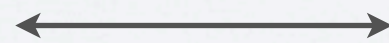
Attacker/packet sniffing

# WEP CRACKING WITH DATA INJECTION

- By creating own packets and sending with know data, one can deduce the IV's much quicker.
- Uses special hardware (Wireless USB) to attack a network.
- No additional traffic needed from other computers.



Server



Attacker/packet sniffing

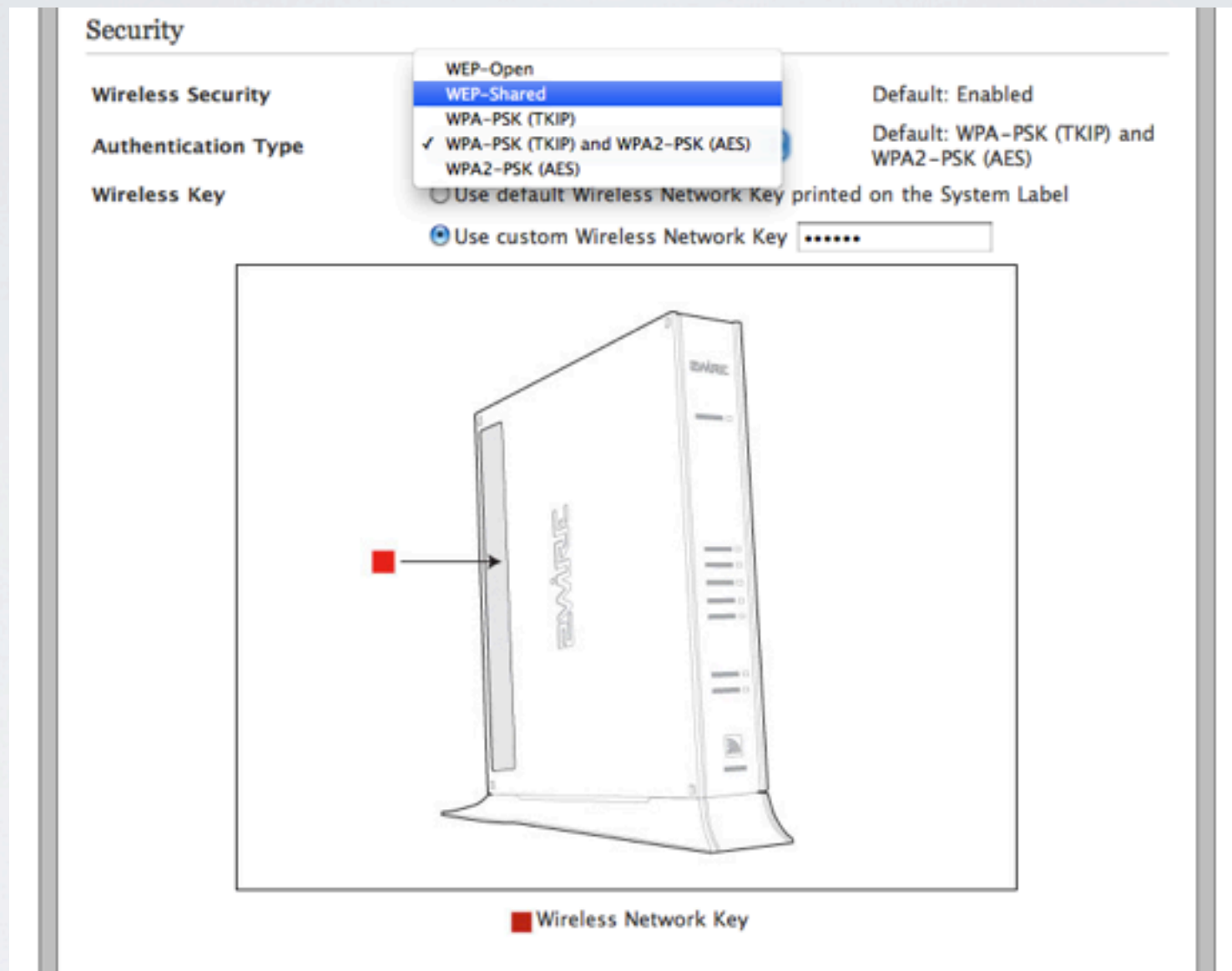


# HOW TO FIX

- Most routers and ad-hoc networks support WPA and WPA 2.
- The only known attacks on WPA and WPA 2 are brute force algorithms so they take significantly longer.
- Uses Temporal Key Integrity Protocol (TKIP) and AES support to provide extra security.

.

# HOW TO FIX



Home configuration



# ADDITIONAL DETAILS

- TKIP - implements a key mixing function that concatenates the IV with the secret key BEFORE sending it to the RC4 algorithm.
- Advanced encryption standard (AES): To solve the repetition problem the AES creates its own finite field (like Finite State machines except with a 4x4 matrix of bytes).

# MORE INFORMATION

- Sample code to simulate the RC4 algorithm: <http://www.security-freak.net/encryption/encryption-rc4.html>
- WEP tutorial with packet injection (needs special hardware) - [http://www.aircrack-ng.org/doku.php?id=simple\\_wep\\_crack](http://www.aircrack-ng.org/doku.php?id=simple_wep_crack)



# END

KisMAC File Edit Channel Network Map Window Help

Screen Sharing Connection Edit View Window Help

Safari File Edit View History Bookmarks Window Help

KisMAC 0.3.3

Cracking successful

KisMAC was able to recover the key of the selected network. It is: 6D:69:6B:65:31

OK

#	Ch	SSID	BSSID	E	W	WPA	WEP	WPA2	WPA3	WPA4	WPA5	WPA6	WPA7	WPA8	WPA9	WPA10	WPA11	WPA12	WPA13	WPA14	WPA15	WPA16	WPA17	WPA18	WPA19	WPA20	WPA21	WPA22	WPA23	WPA24	WPA25	WPA26	WPA27	WPA28	WPA29	WPA30	WPA31	WPA32	WPA33	WPA34	WPA35	WPA36	WPA37	WPA38	WPA39	WPA40	WPA41	WPA42	WPA43	WPA44	WPA45	WPA46	WPA47	WPA48	WPA49	WPA50	WPA51	WPA52	WPA53	WPA54	WPA55	WPA56	WPA57	WPA58	WPA59	WPA60	WPA61	WPA62	WPA63	WPA64	WPA65	WPA66	WPA67	WPA68	WPA69	WPA70	WPA71	WPA72	WPA73	WPA74	WPA75	WPA76	WPA77	WPA78	WPA79	WPA80	WPA81	WPA82	WPA83	WPA84	WPA85	WPA86	WPA87	WPA88	WPA89	WPA90	WPA91	WPA92	WPA93	WPA94	WPA95	WPA96	WPA97	WPA98	WPA99	WPA100	WPA101	WPA102	WPA103	WPA104	WPA105	WPA106	WPA107	WPA108	WPA109	WPA110	WPA111	WPA112	WPA113	WPA114	WPA115	WPA116	WPA117	WPA118	WPA119	WPA120	WPA121	WPA122	WPA123	WPA124	WPA125	WPA126	WPA127	WPA128	WPA129	WPA130	WPA131	WPA132	WPA133	WPA134	WPA135	WPA136	WPA137	WPA138	WPA139	WPA140	WPA141	WPA142	WPA143	WPA144	WPA145	WPA146	WPA147	WPA148	WPA149	WPA150	WPA151	WPA152	WPA153	WPA154	WPA155	WPA156	WPA157	WPA158	WPA159	WPA160	WPA161	WPA162	WPA163	WPA164	WPA165	WPA166	WPA167	WPA168	WPA169	WPA170	WPA171	WPA172	WPA173	WPA174	WPA175	WPA176	WPA177	WPA178	WPA179	WPA180	WPA181	WPA182	WPA183	WPA184	WPA185	WPA186	WPA187	WPA188	WPA189	WPA190	WPA191	WPA192	WPA193	WPA194	WPA195	WPA196	WPA197	WPA198	WPA199	WPA200	WPA201	WPA202	WPA203	WPA204	WPA205	WPA206	WPA207	WPA208	WPA209	WPA210	WPA211	WPA212	WPA213	WPA214	WPA215	WPA216	WPA217	WPA218	WPA219	WPA220	WPA221	WPA222	WPA223	WPA224	WPA225	WPA226	WPA227	WPA228	WPA229	WPA230	WPA231	WPA232	WPA233	WPA234	WPA235	WPA236	WPA237	WPA238	WPA239	WPA240	WPA241	WPA242	WPA243	WPA244	WPA245	WPA246	WPA247	WPA248	WPA249	WPA250	WPA251	WPA252	WPA253	WPA254	WPA255	WPA256	WPA257	WPA258	WPA259	WPA260	WPA261	WPA262	WPA263	WPA264	WPA265	WPA266	WPA267	WPA268	WPA269	WPA270	WPA271	WPA272	WPA273	WPA274	WPA275	WPA276	WPA277	WPA278	WPA279	WPA280	WPA281	WPA282	WPA283	WPA284	WPA285	WPA286	WPA287	WPA288	WPA289	WPA290	WPA291	WPA292	WPA293	WPA294	WPA295	WPA296	WPA297	WPA298	WPA299	WPA300	WPA301	WPA302	WPA303	WPA304	WPA305	WPA306	WPA307	WPA308	WPA309	WPA310	WPA311	WPA312	WPA313	WPA314	WPA315	WPA316	WPA317	WPA318	WPA319	WPA320	WPA321	WPA322	WPA323	WPA324	WPA325	WPA326	WPA327	WPA328	WPA329	WPA330	WPA331	WPA332	WPA333	WPA334	WPA335	WPA336	WPA337	WPA338	WPA339	WPA340	WPA341	WPA342	WPA343	WPA344	WPA345	WPA346	WPA347	WPA348	WPA349	WPA350	WPA351	WPA352	WPA353	WPA354	WPA355	WPA356	WPA357	WPA358	WPA359	WPA360	WPA361	WPA362	WPA363	WPA364	WPA365	WPA366	WPA367	WPA368	WPA369	WPA370	WPA371	WPA372	WPA373	WPA374	WPA375	WPA376	WPA377	WPA378	WPA379	WPA380	WPA381	WPA382	WPA383	WPA384	WPA385	WPA386	WPA387	WPA388	WPA389	WPA390	WPA391	WPA392	WPA393	WPA394	WPA395	WPA396	WPA397	WPA398	WPA399	WPA400	WPA401	WPA402	WPA403	WPA404	WPA405	WPA406	WPA407	WPA408	WPA409	WPA410	WPA411	WPA412	WPA413	WPA414	WPA415	WPA416	WPA417	WPA418	WPA419	WPA420	WPA421	WPA422	WPA423	WPA424	WPA425	WPA426	WPA427	WPA428	WPA429	WPA430	WPA431	WPA432	WPA433	WPA434	WPA435	WPA436	WPA437	WPA438	WPA439	WPA440	WPA441	WPA442	WPA443	WPA444	WPA445	WPA446	WPA447	WPA448	WPA449	WPA450	WPA451	WPA452	WPA453	WPA454	WPA455	WPA456	WPA457	WPA458	WPA459	WPA460	WPA461	WPA462	WPA463	WPA464	WPA465	WPA466	WPA467	WPA468	WPA469	WPA470	WPA471	WPA472	WPA473	WPA474	WPA475	WPA476	WPA477	WPA478	WPA479	WPA480	WPA481	WPA482	WPA483	WPA484	WPA485	WPA486	WPA487	WPA488	WPA489	WPA490	WPA491	WPA492	WPA493	WPA494	WPA495	WPA496	WPA497	WPA498	WPA499	WPA500	WPA501	WPA502	WPA503	WPA504	WPA505	WPA506	WPA507	WPA508	WPA509	WPA510	WPA511	WPA512	WPA513	WPA514	WPA515	WPA516	WPA517	WPA518	WPA519	WPA520	WPA521	WPA522	WPA523	WPA524	WPA525	WPA526	WPA527	WPA528	WPA529	WPA530	WPA531	WPA532	WPA533	WPA534	WPA535	WPA536	WPA537	WPA538	WPA539	WPA540	WPA541	WPA542	WPA543	WPA544	WPA545	WPA546	WPA547	WPA548	WPA549	WPA550	WPA551	WPA552	WPA553	WPA554	WPA555	WPA556	WPA557	WPA558	WPA559	WPA560	WPA561	WPA562	WPA563	WPA564	WPA565	WPA566	WPA567	WPA568	WPA569	WPA570	WPA571	WPA572	WPA573	WPA574	WPA575	WPA576	WPA577	WPA578	WPA579	WPA580	WPA581	WPA582	WPA583	WPA584	WPA585	WPA586	WPA587	WPA588	WPA589	WPA590	WPA591	WPA592	WPA593	WPA594	WPA595	WPA596	WPA597	WPA598	WPA599	WPA600	WPA601	WPA602	WPA603	WPA604	WPA605	WPA606	WPA607	WPA608	WPA609	WPA610	WPA611	WPA612	WPA613	WPA614	WPA615	WPA616	WPA617	WPA618	WPA619	WPA620	WPA621	WPA622	WPA623	WPA624	WPA625	WPA626	WPA627	WPA628	WPA629	WPA630	WPA631	WPA632	WPA633	WPA634	WPA635	WPA636	WPA637	WPA638	WPA639	WPA640	WPA641	WPA642	WPA643	WPA644	WPA645	WPA646	WPA647	WPA648	WPA649	WPA650	WPA651	WPA652	WPA653	WPA654	WPA655	WPA656	WPA657	WPA658	WPA659	WPA660	WPA661	WPA662	WPA663	WPA664	WPA665	WPA666	WPA667	WPA668	WPA669	WPA670	WPA671	WPA672	WPA673	WPA674	WPA675	WPA676	WPA677	WPA678	WPA679	WPA680	WPA681	WPA682	WPA683	WPA684	WPA685	WPA686	WPA687	WPA688	WPA689	WPA690	WPA691	WPA692	WPA693	WPA694	WPA695	WPA696	WPA697	WPA698	WPA699	WPA700	WPA701	WPA702	WPA703	WPA704	WPA705	WPA706	WPA707	WPA708	WPA709	WPA710	WPA711	WPA712	WPA713	WPA714	WPA715	WPA716	WPA717	WPA718	WPA719	WPA720	WPA721	WPA722	WPA723	WPA724	WPA725	WPA726	WPA727	WPA728	WPA729	WPA730	WPA731	WPA732	WPA733	WPA734	WPA735	WPA736	WPA737	WPA738	WPA739	WPA740	WPA741	WPA742	WPA743	WPA744	WPA745	WPA746	WPA747	WPA748	WPA749	WPA750	WPA751	WPA752	WPA753	WPA754	WPA755	WPA756	WPA757	WPA758	WPA759	WPA760	WPA761	WPA762	WPA763	WPA764	WPA765	WPA766	WPA767	WPA768	WPA769	WPA770	WPA771	WPA772	WPA773	WPA774	WPA775	WPA776	WPA777	WPA778	WPA779	WPA780	WPA781	WPA782	WPA783	WPA784	WPA785	WPA786	WPA787	WPA788	WPA789	WPA790	WPA791	WPA792	WPA793	WPA794	WPA795	WPA796	WPA797	WPA798	WPA799	WPA800	WPA801	WPA802	WPA803	WPA804	WPA805	WPA806	WPA807	WPA808	WPA809	WPA810	WPA811	WPA812	WPA813	WPA814	WPA815	WPA816	WPA817	WPA818	WPA819	WPA820	WPA821	WPA822	WPA823	WPA824	WPA825	WPA826	WPA827	WPA828	WPA829	WPA830	WPA831	WPA832	WPA833	WPA834	WPA835	WPA836	WPA837	WPA838	WPA839	WPA840	WPA841	WPA842	WPA843	WPA844	WPA845	WPA846	WPA847	WPA848	WPA849	WPA850	WPA851	WPA852	WPA853	WPA854	WPA855	WPA856	WPA857	WPA858	WPA859	WPA860	WPA861	WPA862	WPA863	WPA864	WPA865	WPA866	WPA867	WPA868	WPA869	WPA870	WPA871	WPA872	WPA873	WPA874	WPA875	WPA876	WPA877	WPA878	WPA879	WPA880	WPA881	WPA882	WPA883	WPA884	WPA885	WPA886	WPA887	WPA888	WPA889	WPA890	WPA891	WPA892	WPA893	WPA894	WPA895	WPA896	WPA897	WPA898	WPA899	WPA900	WPA901	WPA902	WPA903	WPA904	WPA905	WPA906	WPA907	WPA908	WPA909	WPA910	WPA911	WPA912	WPA913	WPA914	WPA915	WPA916	WPA917	WPA918	WPA919	WPA920	WPA921	WPA922	WPA923	WPA924	WPA925	WPA926	WPA927	WPA928	WPA929	WPA930	WPA931	WPA932	WPA933	WPA934	WPA935	WPA936	WPA937	WPA938	WPA939	WPA940	WPA941	WPA942	WPA943	WPA944	WPA945	WPA946	WPA947	WPA948	WPA949	WPA950	WPA951	WPA952	WPA953	WPA954	WPA955	WPA956	WPA957	WPA958	WPA959	WPA960	WPA961	WPA962	WPA963	WPA964	WPA965	WPA966	WPA967	WPA968	WPA969	WPA970	WPA971	WPA972	WPA973	WPA974	WPA975	WPA976	WPA977	WPA978	WPA979	WPA980	WPA981	WPA982	WPA983	WPA984	WPA985	WPA986	WPA987	WPA988	WPA989	WPA990	WPA991	WPA992	WPA993	WPA994	WPA995	WPA996	WPA997	WPA998	WPA999	WPA1000	WPA1001	WPA1002	WPA1003	WPA1004	WPA1005	WPA1006	WPA1007	WPA1008	WPA1009	WPA1010	WPA1011	WPA1012	WPA1013	WPA1014	WPA1015	WPA1016	WPA1017	WPA1018	WPA1019	WPA1020	WPA1021	WPA1022	WPA1023	WPA1024	WPA1025	WPA1026	WPA1027	WPA1028	WPA1029	WPA1030	WPA1031	WPA1032	WPA1033	WPA1034	WPA1035	WPA1036	WPA1037	WPA1038	WPA1039	WPA1040	WPA1041	WPA1042	WPA1043	WPA1044	WPA1045	WPA1046	WPA1047	WPA1048	WPA1049	WPA1050	WPA1051	WPA1052	WPA1053	WPA1054	WPA1055	WPA1056	WPA1057	WPA1058	WPA1059	WPA1060	WPA1061	WPA1062	WPA1063	WPA1064	WPA1065	WPA1066	WPA1067	WPA1068	WPA1069	WPA1070	WPA1071	WPA1072	WPA1073	WPA1074	WPA1075	WPA1076	WPA1077	WPA1078	WPA1079	WPA1080	WPA1081	WPA1082	WPA1083	WPA1084	WPA1085	WPA1086	WPA1087	WPA1088	WPA1089	WPA1090	WPA1091	WPA1092	WPA1093	WPA1094	WPA1095	WPA1096	WPA1097	WPA1098	WPA1099	WPA1100	WPA1101	WPA1102	WPA1103	WPA1104	WPA1105	WPA1106	WPA1107	WPA1108	WPA1109	WPA1110	WPA1111	WPA1112	WPA1113	WPA1114	WPA1115	WPA1116	WPA1117	WPA1118	WPA1119	WPA1120	WPA1121	WPA1122	WPA1123	WPA1124	WPA1125	WPA1126	WPA1127	WPA1128	WPA1129	WPA1130	WPA1131	WPA1132	WPA1133	WPA1134	WPA1135	WPA1136	WPA1137	WPA1138	WPA1139	WPA1140	WPA1141	WPA1142	WPA1143	WPA1144	WPA1145	WPA1146	WPA1147	WPA1148	WPA1149	WPA1150	WPA1151	WPA1152	WPA1153	WPA1154	WPA1155	WPA1156	WPA1157	WPA1158	WPA1159	WPA1160	WPA1161	WPA1162	WPA1163	WPA1164	WPA1165	WPA1166	WPA1167	WPA1168	WPA1169	WPA1170	WPA1171	WPA1172	WPA1173	WPA1174	WPA1175	WPA1176	WPA1177	WPA1178	WPA1179	WPA1180	WPA1181	WPA1182	WPA1183	WPA1184	WPA1185	WPA1186	WPA1187	WPA1188	WPA1189	WPA1190	WPA1191	WPA1192	WPA1193	WPA1194	WPA1195	WPA1196	WPA1197	WPA1198	WPA1199	WPA1200	WPA1201	WPA1202	WPA1203	WPA1204	WPA1205	WPA1206	WPA1207	WPA
---	----	------	-------	---	---	-----	-----	------	------	------	------	------	------	------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	-----



# SOURCES

- All artwork is from[2011] <http://www.openclipart.org>
- WEP algorithm[2011] <http://palisade.plynt.com/issues/2006Dec/wep-encryption/>
- Cracking WEP in detail[2011] - <http://palisade.plynt.com/issues/2007Feb/cracking-wep/>
- Wired Equivalent Privacy (WEP) - <http://www.airtightnetworks.com/home/resources/knowledge-center/wep.html>



# SOURCES PART 2

- ACCESS DENIED[2001] - Cathy Cronkhite and Jack McCullough. Pg 117-139. Network Security Weakness
- Cryptography Engineering Design principles and practical applications[2010] - Niels Ferguson, Bruce Schneier Tadayoshi Kohno. Pg 195-211. RSA
- Fundamentals of Network Security[2001] - John E. Canavan. Pg. 178, 64-65, 68. RSA, WEP protocol.
- Crimeware Understanding New Attacks and Defenses[2008]- Markus Jakobsson, Zulfikar Ramzan. Pg. 122-123, 111. Airsnort Defeating, encryption options for wireless networking.