ECE 478

University of Arizona

Project 2:

Studying The Internet Topology

Kai Ward

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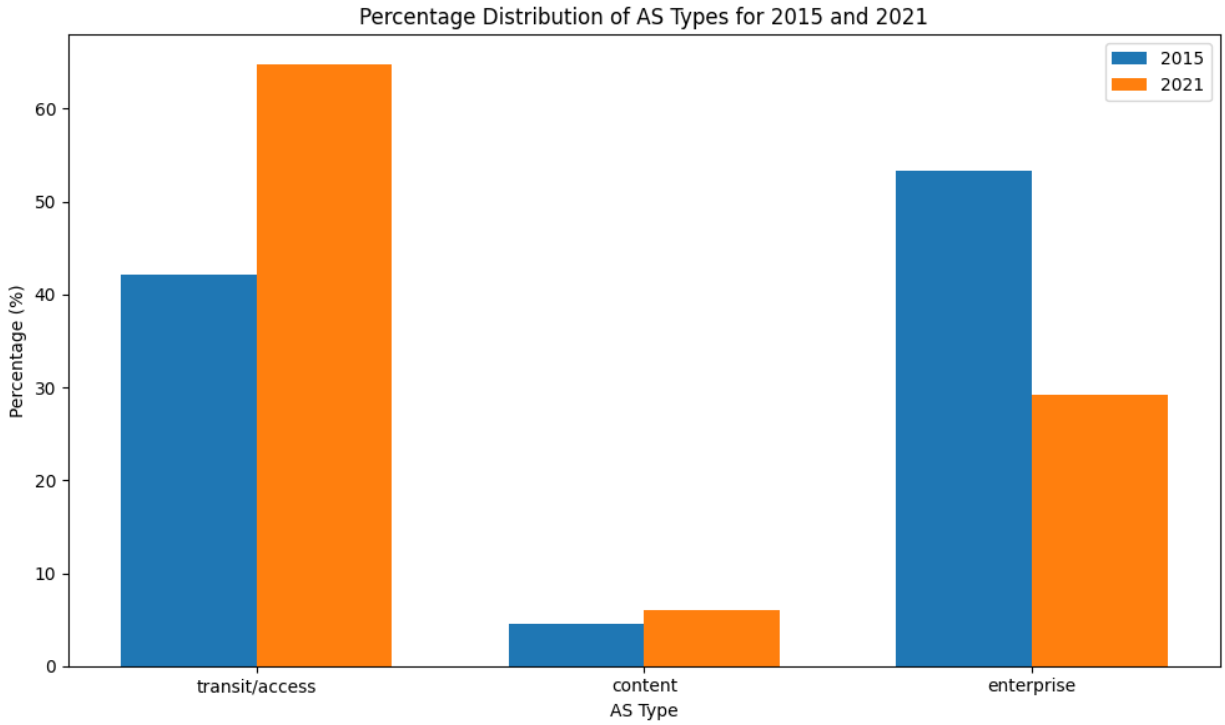
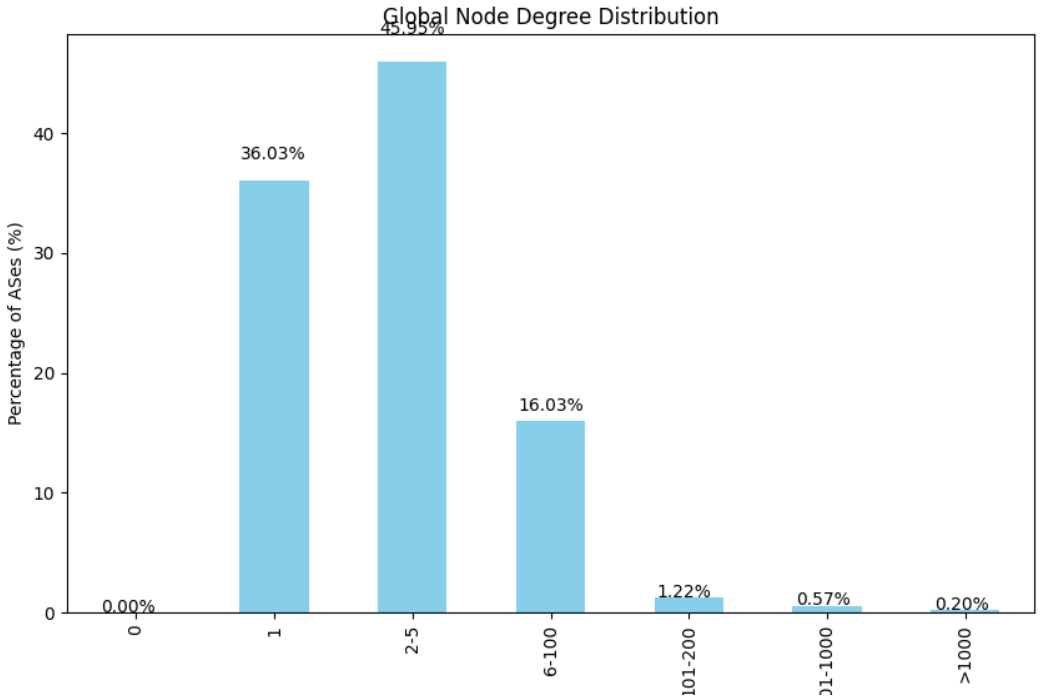
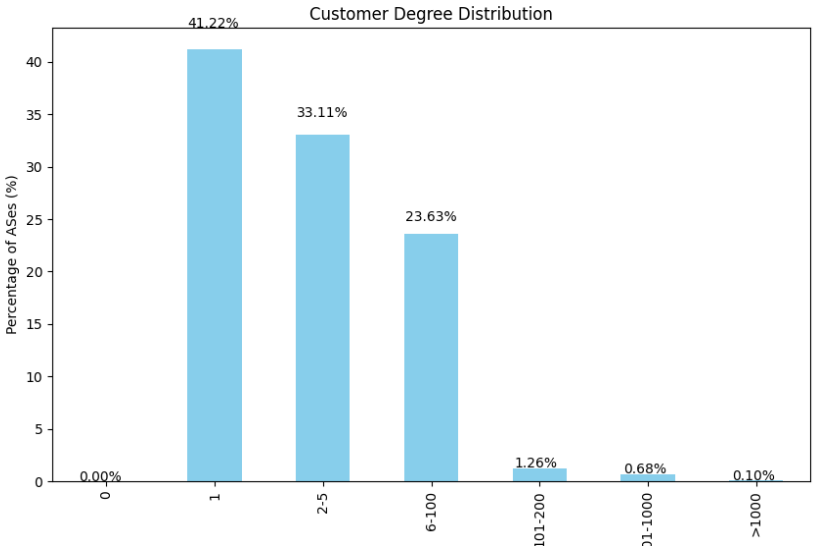
Comparing these two years of 2015 and 2021 there has been a substantial shift towards transit/access. In 2015 the Enterprise category was the most prevalent with transit being second. Content is still the smallest percentage but seems to have grown a little still. The reason for the increase for the Transit category can be the result of the growing desire to used cloud services where higher bandwidths are needed for a faster and more stable connection.



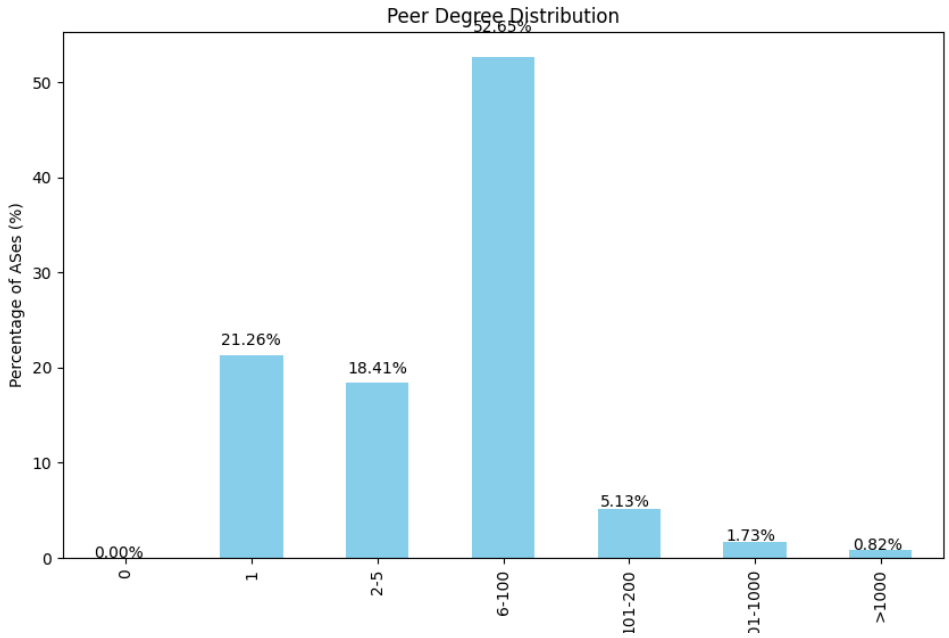
The Global distribution graph shows that there are very few nodes that have many connections and a lot that have only a few connections. This makes sense with what we have learned in the class as there are some spots on the internet map that act as a sort of hub to facilitate traffic. The other connections form the rest of the links that allow for networks to hop through other nodes to get to their destination.



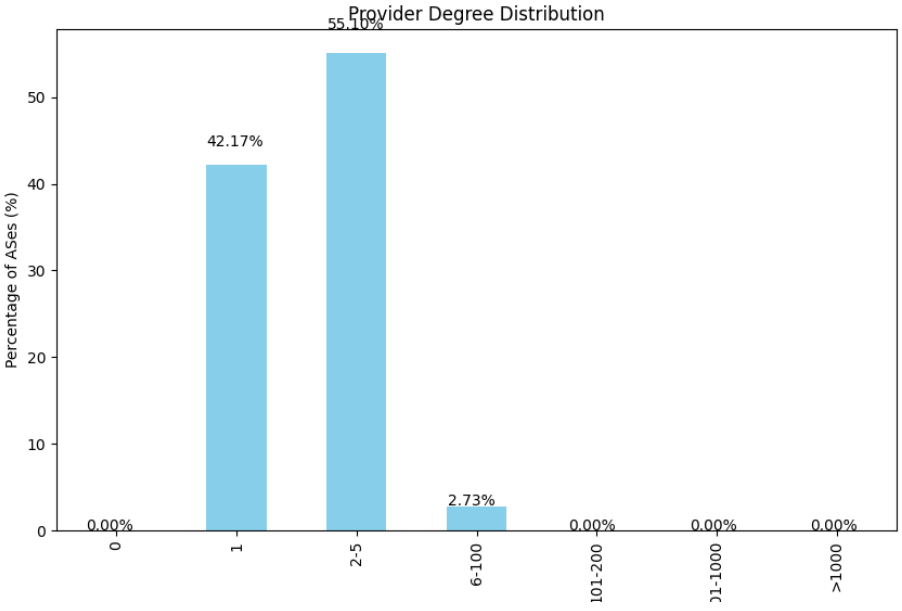
The customer graph shows that only a few AS have expanded to the point where they serve many different types of customers and many more seem to specialize in one area or another.



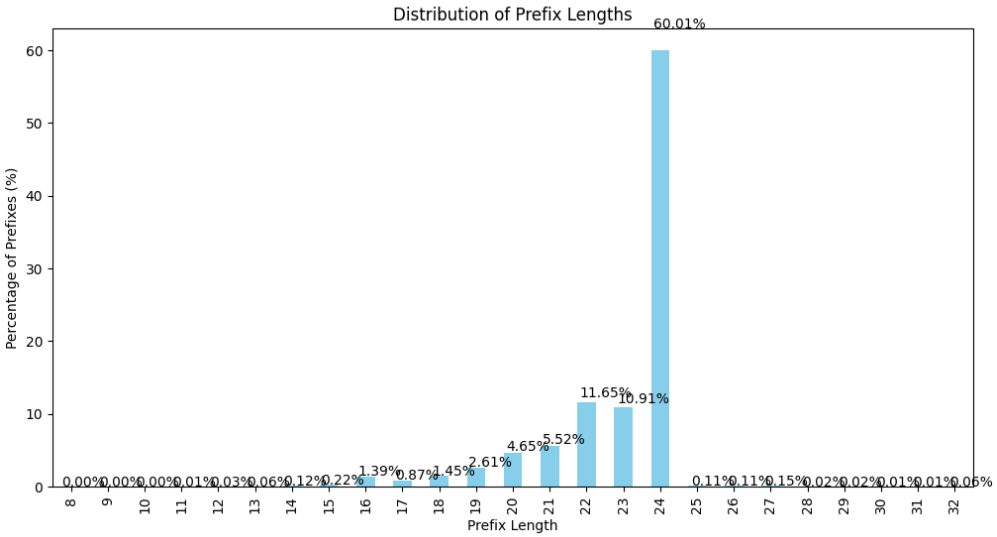
The peer graph shows that most reside within the 6-100 category. This tells us that most ASes engage in a decent amount of peer to peer communication. This gives the internet a good amount of redundancy and also shops that there are a few ASes that act as hub to facilitate many peer to peer connections



The provider graph shows a steep decline after the 2-5 category. This shows us that many ASes have only a few providers and also shows that many networks just rely on a limited number of providers for connectivity. The drop to zero shows that there are no ASes that require a lot of providers to keep them up and connected.



These prefix lengths were chosen based on the data and also based on common subnet mask lengths. This way we can see better how the ip space is allocated by looking closer at the actual values. 24 is by far the most common subnet which would suggest there are more smaller networks compared to a larger subnet of maybe 8.



We can see that this graph is consistent with graph 1 in that transit has the highest percentage by far. However we also see that enterprise has dropped off completely. This may be an error in the code. We also see that content takes the rest of the percentages which it being lower than transit is still the same.

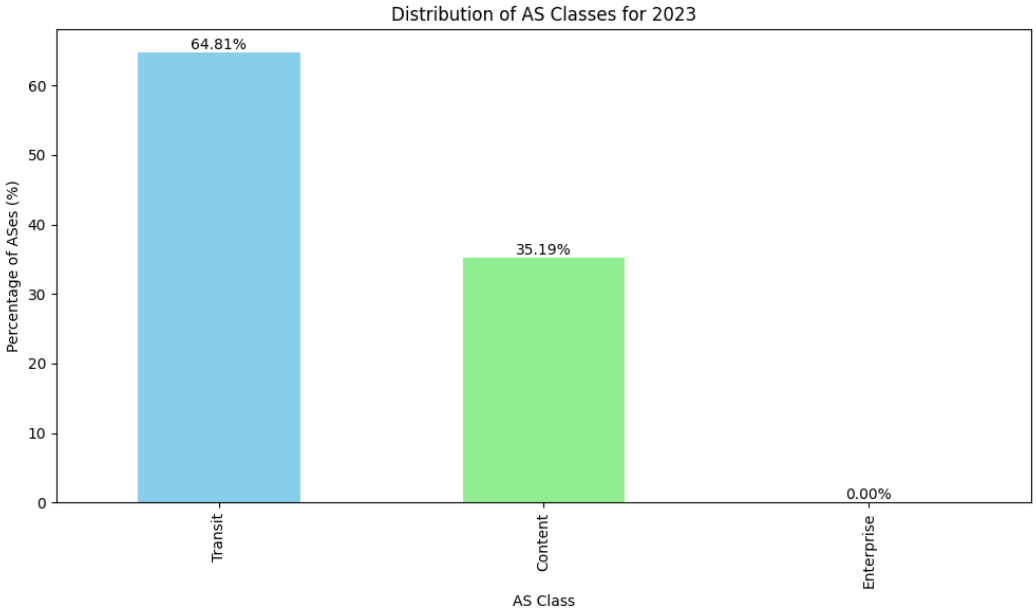


Table 1:
Nothing stated to report about

	AS Number	Organization	Number of Incident Links
1	6939	Hurricane Electric LLC	9753
2	24482	SG.GS	8080
3	49544	i3D.net B.V	6898
4	199524	G-Core Labs S.A.	6262
5	1828	Unitas Global LLC	5941
6	39120	Convergenze S.p.A.	5889
7	35280	F5 Networks SARL	5298
8	37721	Virtual Technologies & Solutions	4845
9	6057	Administracion Nacional de Telecomunicaciones	3632
10	263152	MIGO TELECOM	3596

Extra credit:
Nothing stated to report about

	AS #	AS name	AS degree	customer cone number of ASes	IP Prefix	IPs	percentage of ASes	IP Prefix	customer percentage of IPs
1	3356	Level 3 Parent, LLC	6564	4676	40558	37671104	3.897739	0.180438	0.894255
2	174	Cogent Communications	6684	4450	88503	28870400	3.709353	0.393740	0.685339
3	7018	AT&T Services, Inc.	2400	2217	54567	113672193	1.848008	0.242762	2.698405
4	6461	Zayo Bandwidth	2687	1837	4286	1594880	1.531254	0.019068	0.037860
5	3257	GTT Communications Inc.	2762	1515	19716	6838848	1.262847	0.087714	0.162344
6	6939	Hurricane Electric LLC	9753	1230	4940	601088	1.025282	0.021977	0.014269
7	701	Verizon Business	1270	1101	19813	43186944	0.917752	0.088146	1.025192
8	1299	Arelion	2415	984	1924	227072	0.820226	0.008560	0.005390
9	8220	COLT Technology Services Group Limited	2103	946	3592	1380864	0.788550	0.015980	0.032780
10	46887	Lightower Fiber Networks I, LLC	953	893	16602	1043968	0.744371	0.073860	0.024782
11	286	GTT Communications Inc.	1536	877	0	0	0.731034	0.000000	0.000000
12	209	CenturyLink Communications, LLC	960	869	39364	26210048	0.724366	0.175126	0.622187
13	12389	PJSC Rostelecom	1271	837	66065	16602368	0.697692	0.293916	0.394115
14	1239	Sprint	2090	800	13146	12162694	0.666850	0.058485	0.288724
15	9498	Bharti Airtel Limited	1255	735	77175	3752704	0.612668	0.343343	0.089083