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The Compromised Devices of the Carna Botnet

As used for the Internet Census 2012

Parth Shukla

This article will showcase the latest analysis and the progress of industry collaboration on the problem of Internet facing devices that have default credential logins through telnet. The Carna Botnet, which was used to perform the first-ever map of the Internet – Internet Census 2012 – highlighted a major information security concern with devices that allow default credential login from the Internet by default. For more information on the Internet Census 2012, please refer to the anonymous researcher's paper.

A complete list of compromised devices that formed part of the Carna Botnet was obtained exclusively by Parth Shukla. This list is NOT publicly available from any source. This data was acquired directly from the anonymous researcher who performed the Internet Census. As confirmed by the researcher, AusCERT to date remains the only organization and researcher in the world that has the complete dataset. Relevant snippets of this data, however, have been provided to CERTs around the world in order to reduce the threat made explicit by the Carna Botnet.

This article will provide a detailed analysis of all the different identifying information for each of the compromised devices that formed part of the Botnet. This detailed analysis will showcase the prevalence of easily-exploitable devices in different countries, regions and in different manufacturers. The ultimate aim of this article is to continue to draw public awareness to the larger concerns faced by information security professionals worldwide. Hopefully, this awareness will persuade manufacturers and even local ISPs to collaborate and address this problem. The Carna Botnet reminds us all that there are numerous, simpler vulnerabilities at risk of exploitation and in need of immediate attention.

The contents of this paper were first released to AusCERT members on 20 August 2013 and to the public on 25 August 2013.

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1 Introduction

This research paper focuses on a detailed analysis of approximately 1.3 million compromised devices that formed part of the Carna Botnet and were utilised to derive the results of the 'Internet Census 2012'. The 'Internet Census 2012' was a /0 scan of all allocated IPv4 ranges which resulted in the publication of 9 Terabytes of text data. This data was made available for download using a torrent. For more details on Carna Botnet's role in the 'Internet Census 2012', please refer to the original paper by the anonymous researcher[1].

The data used in this analysis is NOT included in the torrent which is publicly available for download. The torrent only contains the 9 TB of data in compressed ZPAQ format from the /0 scanning.

This research paper will highlight the serious issues brought to focus by the Carna Botnet on a global scale. In order to bring many IT security issues to the centre stage, this paper will analyse the distribution of manufacturers of the compromised devices, the location of these devices worldwide, the type of compromised devices involved and the ease of re-locating these devices on the IPv4 Internet for harmful purposes.

As at the publication date of this paper, AusCERT is the only organisation or researcher in the world, other than the original researcher, that has a full copy of this data. As such, every effort is made throughout this report to make the process of analysis as transparent as possible by detailing all assumptions, methodologies, results and conclusions. This would allow other prospective researchers to verify the quality and authenticity of the data and this report without needing access to the raw data.

1.1 Compromised Devices

The devices that formed part of the Carna Botnet were compromised by opening a telnet connection to them and successfully authenticating with one of the many well-known default credential combinations such root:root, root:password, admin:admin, etc. Once authenticated, custom binaries could be uploaded and executed on the device unhindered, along with custom commands. On almost all embedded devices, successful authentication via telnet drops the user into a root shell allowing unfettered access to the entire device. The anonymous researcher notes that the custom binaries s/he uploaded to perform the Internet Census 2012 were programmed to have minimal interference to the device's function and did not make any permanent changes to the device. This meant that a reboot of the device would clean the device of the custom binaries. Please note that the device would still be vulnerable to the same attack again.

As the Carna Botnet was run alongside the Internet Census 2012 project, every single IP address on the IPv4 range was scanned for an open telnet port (on port 23) and an attempt to login with one of the default credentials was made. All attempts that succeeded added another device to the Carna Botnet. Since the whole of the IPv4 space was scanned with the use of already compromised devices, the Carna Botnet represents an almost complete list of devices vulnerable to default login via telnet at the time of its activity. Devices were compromised multiple times between March and December 2012.

1.2 Scope

The Carna Botnet data obtained by AusCERT only contains a list of compromised devices that allowed the use of the 'ifconfig' command. The 'ifconfig' command, along with other Linux commands, was used to gather useful identifying information for each compromised device. The data analysed in this paper was compiled by aggregating this information for each of the compromised devices.

According to the research paper, 70% of compromised devices in the Carna Botnet were either too small, did not run Linux or were otherwise limited (e.g. no 'ifconfig' or limited shell). Obtaining useful identifying information for such devices is extremely difficult given their limitations and as a result these devices were not part of the data AusCERT was given. The researcher has indicated that traceroutes of some of these devices are available as part of the torrent download.

This research paper will focus on analysing the Carna Botnet data obtained by AusCERT in conjunction with other publicly available data. Analysis of other Carna Botnet information or the Internet Census 2012 is beyond the scope of this paper.

2 The Data

The data obtained by AusCERT contained the following information in each record:

1. MAC address of the device
2. Name of device manufacturer
3. RAM in kilobytes
4. Output of command 'uname -a'
5. Output of /proc/cpuinfo
6. List of all IP addresses that were associated with the device at some point during the compromise. A device may have its IP changed for many reasons. The most likely reason being DHCP.
    - Two letter country code for each of the IPs – identifying which country the IP address was geographically located in.

The researcher notified AusCERT that before supplying the data to AusCERT, s/he had:

- Replaced the last byte of each MAC address with

1 Internet Census 2012 http://internetcensus2012.bitbucket.org/paper.html

an ascending number. No information on when this was done was provided.

- Zeroed the last byte of each of the IP addresses, limiting accuracy of each IP to within a C class or a /24 subnet. This leaves 256 possibilities of the actual IP address of the device.

The researcher further informed AusCERT that:

- All the supplied data was gathered between August and December 2012.
- MAC addresses and list of IP addresses were gathered by parsing the 'ifconfig' command.
- Name of device manufacturer was derived from the first 3 bytes of the MAC address using the nmap's MAC address database.
- RAM was obtained by parsing the output of /proc/meminfo
- Country codes for each IP were derived using the maxmind.com free GeoIP database before the last byte was zeroed.
- S/he noticed duplicate MAC addresses: "Mac addresses don't seem to be as unique as they should be. While operating the network I verified this multiple times by manually telneting into several devices on different IPs that had the same MAC address."
- S/he had provided all data s/he had stored to AusCERT and that s/he does not have the non-zeroed list of MAC addresses or IP addresses: "The public torrent and the list you have is everything I stored."

From what the researcher told AusCERT, it is assumed:

- That the researcher purposefully replaced the last byte of the MAC address with an ascending number to avoid confusion of duplicate records appearing in the data for devices s/he observed with the same MAC address.
- That the researcher purposefully zeroed the last byte of the IP address as a security measure.

2.1 Determining Accuracy of the Data

It is standard practice to check for the accuracy and consistency of a given dataset, especially when it was provided by an anonymous source.

The most direct way of ascertaining the accuracy of the data is to scan some of the IP ranges from the data, attempt to compromise open telnet ports using default credentials and then compare the outputs of various commands on the compromised device to the information stored in each of the fields in the data. However, it is not possible to follow this approach as the act of logging into a device without authorisation from the owner would be considered illegal in many countries, including Australia where this research paper was compiled.

Furthermore, even if scanning was legally possible, it would most likely fail to provide any verifiability of the data given how long it has been since the devices were first compromised. Even assuming that the turnover of devices on the IPv4 Internet is negligible, the information on the existence of the Carna Botnet has been public since March 2013. As a result of the emergence of the open source tool LightAidra[2], it is very likely that malicious people around the world have taken control of most of the devices in the data. After taking control, malicious people can easily choose to close the telnet port or change the default password to prevent interference by others, including researchers. Hence, even if legally possible, scanning and regathering information to ascertain accuracy of our dataset would most likely fail. More details on the topic of re-locating these devices, including information on LightAidra are discussed under section 'Detection and Removal' on page 560.

The strongest support for the validity of this data comes from the logistical problem of attempting to scan all of the allocated IPv4 Internet, which contains 3,706,650,624 IP addresses. It is obvious that for an in-depth /0 scan, a botnet of considerable size would be required to be able to complete such a scan within an acceptable timeframe so as to avoid the data becoming out-dated. The publication of the 9 TB of data as a result of such a scan is a strong indication of the legitimacy of the existence of such a botnet (named Carna Botnet by the researcher). The accompanying research paper of the /0 scan and preliminary analysis of the data itself from researchers around the world provide confidence to the 9 TB of data and as subsequently to the ≈1.3 million records of the Carna Botnet data.

Although it would be possible for the ≈1.3 million records in the data to be forged, this seems highly unlikely given the data was provided to AusCERT without any payment or promise from AusCERT. Furthermore, it would take enormous amounts of time, effort and even resources to fake such records - arguably more time and effort than required to actually gather the real data. The comprehensiveness and the internal consistency (See 'Internal Consistency Check' on page 552) of the data provide further support to its accuracy.

Please note that methods were used to verify, without compromising anonymity, that the person who supplied the data to AusCERT was the same person who published the research paper along with the 9 TB of data.

Given all of the above facts and reasons, it is assumed with a reasonable amount of certainty that the data supplied is legitimate and correct at the time of its compilation and therefore worth analysing.

2.2 Refining Data for Analysis

Preliminary analysis was performed in order to locate the data to focus on that could be analysed in detail; which could then be used to gain insight into the Carna Botnet. It was vital to eliminate any unneces-

2 LightAidra https://github.com/eurialo/lightaidra

sary data that could not contribute to the final analysis and would only lead to noise and/or more uncertainty.

Firstly, records that did not contain any IP ranges were removed. Without IP ranges, it is not possible to geolocate devices, muting any other detailed analysis done on those devices.

Secondly, any records which contained multiple IP ranges that belonged to more than one country were removed as they could not be accurately allocated to just one country for the purposes of this analysis. This ultimately did not remove many records (only $\approx$0.11%), as can be seen in Figure 1.

Finally, it is important to ensure that no device appears more than once in the data. It is possible for the same device to be re-compromised multiple times and re-added to the data – giving us the same device more than once in the data. A data gathering error could also add the same device to the data more than once. The goal is to remove all records representing a duplicate device so that, of the remaining records, we can confidently say that each record represents a unique device in the Carna Botnet. However, it is not easy to identify duplicate devices given the complexity of the data fields and especially given the obfuscated IP and MAC address fields.

The most unique field in the data is the MAC address field. However, since the last byte of the MAC address has been changed to an ascending number, two records which both have the same MAC address do not necessarily have to represent the same device. A data generation error by the researcher could have assigned the same ascending number to two distinct devices. Furthermore, no practical proof exists to provide a guarantee that every device will have a unique MAC address. Although this must be the case in theory, devices with Locally Administered MAC addresses can end up having non-unique MAC addresses. These complications prevent the deletion of records simply by checking for duplicate MAC addresses.

The IP addresses field is the second most unique field in the dataset. Similarly to MAC addresses, the last byte of the IP addresses field is zeroed out, giving us C class IP ranges. Again, two records with the same IP ranges do not necessarily represent the same device as multiple devices could have been compromised on the same IP range. Furthermore, over time as a result of DHCP, the same IP address could have been assigned to multiple distinct devices; all or some of which may have been compromised and added to the data. These complications with the IP addresses field prevent the deletion of records simply by checking for duplicate IP ranges.

All the other fields (ram, uname, cpuinfo) are not very unique and cannot be used by themselves to help identify unique devices as they are common enough to be shared by many devices. However, to start with, these fields, together with the MAC and IP addresses fields can be used in conjuction with each other to help identify duplicates.

A search for complete duplicates revealed 49,931 duplicate records. Only duplicate records that were identical in every field of the record were searched. In this search, the same record appeared at most twice even for devices with many multiple IP ranges, which strongly indicated that a data gathering error is responsible for these duplicates. It seems very likely that the record was added twice to the data when data aggregation was performed. The assumption is that the same data subset was aggregated into the large dataset twice by mistake by the researcher. It is still possible that some of the duplicates could represent legitimate devices. For example, a vulnerable router sold by an ISP to its customers could have consecutive MAC addresses and may end up on the same IP range. Due to data generation errors with the last byte of the MAC addresses, these two unique devices can end up having the same MAC address in the data. They can obviously share the same IP range because they connect to the same ISP and will also share the same info across all the other fields since it is the same product. However, the likelihood of legitimate devices in this search seem slim compared to the more plausible explanation of duplicate aggregation due to human error. Hence, these records were removed from the data to increase its integrity.

Duplicates in the records could still exist as records with multiple IP addresses may not necessarily have the IP addresses ordered in any particular manner and hence may not have been detected as duplicate when looking for identical records. Given all other fields are identical, a record containing "1.2.3.0; 5.6.7.0" in its IP addresses field would have been considered different from a record containing "5.6.7.0; 1.2.3.0" in its IP addresses field.

The IP addresses and Country Code fields were temporarily removed from all records in order to see if further duplicates existed. After the removal of these fields, an attempt to find duplicate records on the remaining fields failed to reveal any matches. This confirmed that duplicate records as result of unordered IP addresses did not exist in the remaining data. Further checks revealed that all IP ranges were stored in an ordered fashion. 1336 instances of duplicate IP ranges being present in the same record were discovered in 685 records. Assuming DHCP movement of the device within the same subnet, these were left untouched. These only represent 0.02% of IP ranges, hence leaving them or removing these would have no stastical impact on the results.

In the end, as shown in Figure 2, approximately 4% of the records were removed.

It is possible to locate other possible duplicates in the remaining 'Unique Records'. Since the last byte of the MAC address was generated by the researcher, it does not provide any real information. Hence, the last byte of the MAC address was removed from every record and another search for complete duplicates was performed to see if further identical records exist in the data. This search revealed 72,778 (5.6% of 'Unique

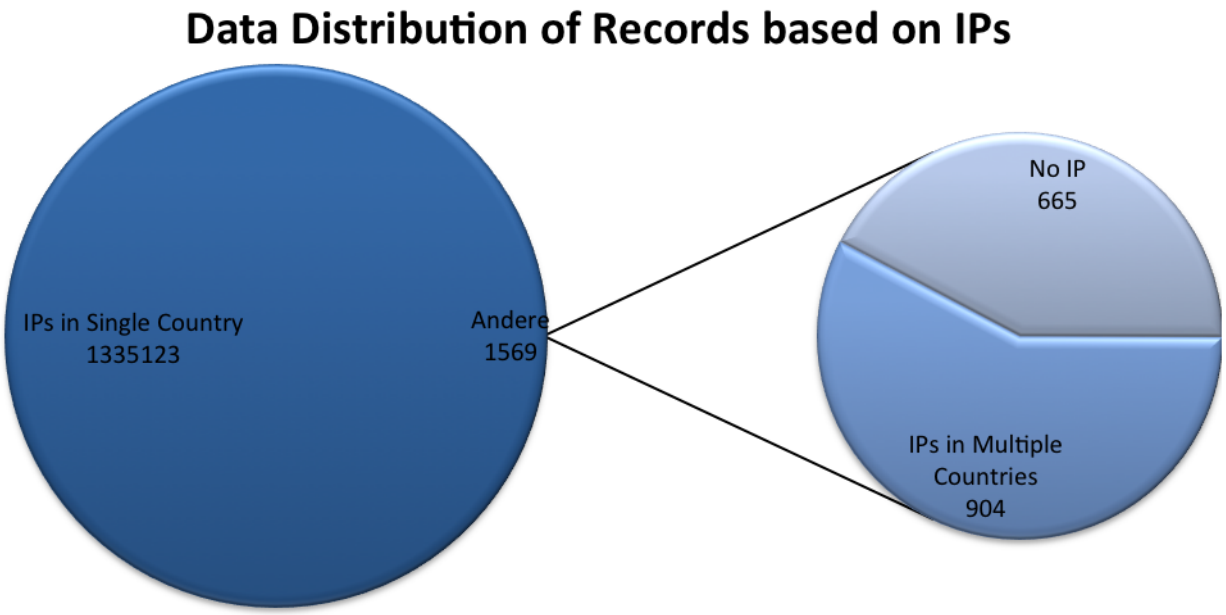


Figure 1: Removing Records that could not be used for analysis

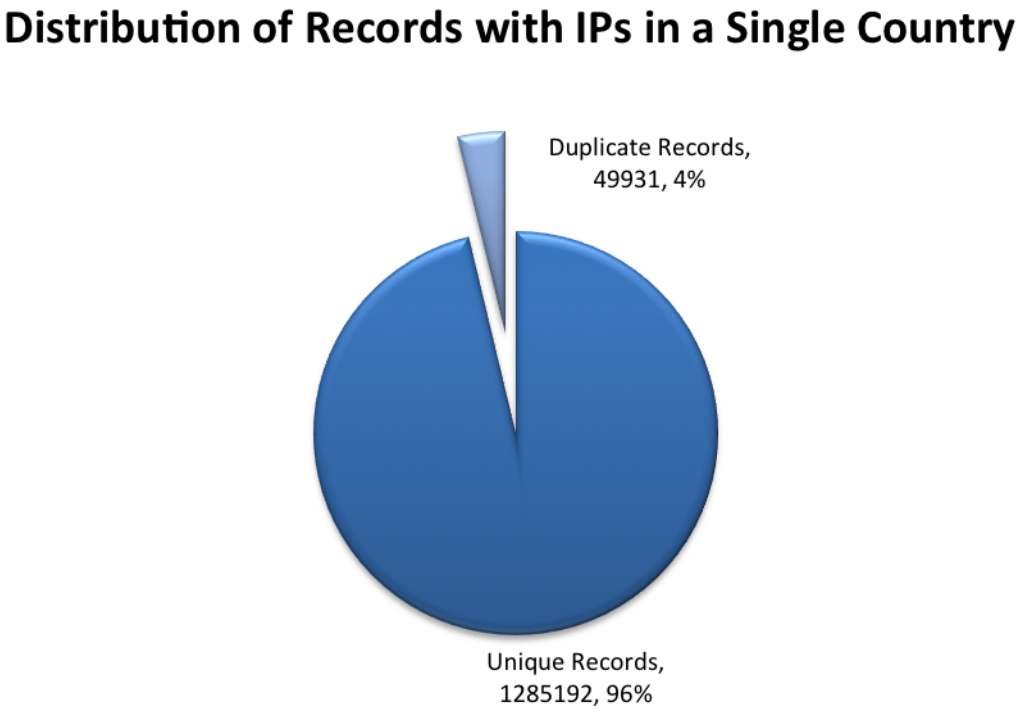


Figure 2: Removing Duplicates

Records') duplicate records which duplicated 30,255 records. The most repeated record had 149 other duplicates.

A duplicate record in this search does not necessarily indicate a duplicate device. Since the last byte of the MAC address and the last byte of an IP range both support 256 possibilities along with the fact that the IP addresses do not have timestamps associated with them, it is entirely possible to have up to 255 duplicates of any given record without causing any concern. Since the worst offender in the search has 149 duplicates, it is entirely possible for all of these duplicates to be legitimate devices.

The higher the number of duplicates of a given record, the more probable that at least some of those duplicate records actually represent duplicate devices. Therefore, if a given record was duplicated 255 times, then there would be a good chance that perhaps one or two of those duplicate records represent duplicate devices. However, the probability decreases the lower the number of duplicates for a given record. Hence, if a record only had 1 other duplicate then there is a very low chance that it is actually a duplicate device given the 256 possibilities for the MAC address and the IP ranges.

Out of the 30,255 records duplicated, 29,187 (96.47%) were duplicated 9 times or less, with 27,327 (90.32%) duplicated 4 times or less. Therefore, it seems highly probable that most of the duplicate records actually represent distinct unique devices. This possibility is further strengthened by the researcher's note on finding the same MAC addresses on distinct devices. It can be assumed that the researcher attempted to avoid duplicates in the data when s/he was replacing the last byte of the MAC addresses to deal with the problem of duplicate MAC addresses. This assumption can provide an explanation as to why obvious duplicates as a result of re-compromises of the same device were not detected in this data.

All of the above reasons prevented the removal of these duplicates found in this search from the dataset to be used for analysis. Detailed analysis later will reaffirm how most of these duplicates are a lot more likely to be distinct legitimate devices given how certain vulnerable devices seem to be grouped within certain MAC and IP address ranges.

In conclusion, the records indicated as 'Unique Records' in Figure 2 were used for the rest of the analysis in this paper unless specified otherwise.

The 1,285,192 'Unique Records' reveal that the data contained:

- 200 unique country codes
- 2,098 unique device manufacturers (after being re-derived, see 'Internal Consistency Check')
- 3,880 different RAM sizes
- 10,875 unique unames
- 35,997 unique CPUs
- 787,665 unique C class IP ranges
- 1,264,223 unique MAC addresses

2.3 Internal Consistency Check

There are two fields in the data that were derived from external sources and these can be checked for consistency. The manufacturer's field was derived from the MAC addresses and the Country Codes were derived from the IP addresses field.

The IEEE allocates universally administered MAC addresses to manufacturers around the world. According to IEEE specifications, the first 3 bytes of the MAC address, known as Organisationally Unique Identifier (OUI), can be used to identify the organisation to which that MAC address range was allocated. The list of MAC addresses to manufacturer allocations is available for searching and downloading on the IEEE website.[3] This list can be used to perform a consistency check of the manufacturer field with the MAC address field.

Preliminary statistics were drawn up to understand the distribution of manufacturers in the data. These statistics are represented in Figure 3. The figure revealed that 266,252 devices (21%) had an 'unknown' manufacturer. Such a high degree of 'unknown' seems to indicate a problem somewhere. A quick manual check of some of the MAC addresses that had 'unknown' in their manufacturer field against the IEEE list revealed that these devices actually did have known manufacturers. As a result, all records with 'unknown' manufacturer were removed to see if the rest of the data was still consistent. This was done based on the assumption that the reason for an 'unknown' being recorded was either because of a data gathering error or that the nmap database used by the researcher was incomplete/inconsistent.

To check for consistency on the remaining 1,018,940 records, manufacturers were re-derived and stored in a new field 'manufacturers-re-derived'. This was done by searching through the IEEE list with the first 3 bytes of the MAC address of each record and recording the result of the search. Since the original 'manufacturer' field in the data stored its values in all lower case characters with all non-alphabetical characters removed, the IEEE list was modified to convert all characters to lower case and to remove all non-alphabetical characters from the manufacturer's name. This conversion was done to allow for easier comparison.

Next, statistics were created for the distribution of manufacturers in this re-derived field. These statistics were an identical match (apart from the 'unknowns' that were removed) to those created from the original field as shown on Figure 3. Next, a character by character comparison was performed between the 'manufacturer' field and the 'manufacturers-re-derived' field for each of the records. This revealed no anomalies. The 'manufacturers-re-derived' field was hence removed, as the data stored in the 'manufacturer' field was found to be consistent against the IEEE records.

3 OUI Public Listing http://standards.ieee.org/develop/regauth/oui/public.html

All records with 'unknown' manufacturers were checked against the IEEE list and results used to update the field with the correct manufacturer. The statistics for the worldwide distribution of manufacturers were drawn up once more and this new graph is represented in Figure 4.

Many manufacturers are registered with the IEEE with similar names. For example, for different MAC ranges, D-Link is registered as 'dlink systems inc' or 'dlink corporation' etc. Such cases were intentionally left untouched as each of the above names are registered in different countries and although representing one brand, likely represent different parts of the same company.

Although no manufacturer names were manually updated in such scenarios, the earlier effect of manufacturer name simplification was the aggregation of similar manufacturer names, i.e. "D-Link" and "dlink" would match up automatically when all manufacturer names are converted to lower case and all non-alphabetical characters removed.

In the end, the 'unknown' manufacturers were reduced from 21% down to 6% as a result of re-matching against the official IEEE list. However this percentage of unknown manufacturers is still concerningly high. According to the IEEE specification there are two types of MAC addresses, 'Universally Administered MACs' and 'Locally Administered MACs'. Universally administered MACs are allocated by the IEEE according to their policies to manufacturers. Locally administered MACs are MAC addresses that could be considered the MAC equivalent of private IPv4 ranges like 192.168/16. Locally administered MACs are pre-allocated ranges that can be used for manual assignment by anyone. One use of these ranges could be for assigning MAC addresses on virtual machines.

According to the IEEE 802-2001 standard, whenever the second least significant bit of the first octet of a MAC address is set to 1, the MAC address is considered "locally assigned and have no relationship to the IEEE-assigned values (as described herein)."[4] Therefore, any MAC address whose second HEX digit is 2, 3, 6, 7, A, B, E or F would be considered locally administered.

A search for locally administered MAC addresses using this specification revealed nearly 4% of MAC addresses as locally administered - not surprisingly all of these were exclusive to the 'unknown' manufacturer range. Therefore only 2% of devices were actually from unknown manufacturers. This is an acceptable figure and can be easily accounted for by multiple factors such as human error when manually setting the MAC address, or misuse by organisations using MAC addresses without paying the fees necessary to purchase an allocation. Figure 5 highlights how the recognised and unrecognised manufacturers split over the data.

In conclusion, the MAC addresses and the manufacturer field of the data are consistent.

Next, the consistency between the IP Address and Country Code fields was checked. Many companies provide access to an IP geolocation database to map IP addresses to physical locations around the world. As potentially millions of lookups may be required and to avoid releasing the list of IP ranges via insecure queries, it would be preferable to execute lookups against a local database rather than an online source. MaxMind provides access to a free database[5] of IP to country geolocation that can be downloaded. This database can then be searched locally using the Linux tool 'geoiplookup'[6] that is available on many Linux distributions. This database and the 'geoiplookup' tool were used to check for the consistency between the IP Address and Country Code fields.

All of the 787,665 unique C class IP ranges from the data were searched against the downloaded GeoIP database and the returned country code was saved in a new field in the data called 'country-code_re-derived'. Next, a comparison between the pre-stored Country Code field against the newly evaluated 'country-code_re-derived' field was completed on each of the IP ranges to find all IP ranges that had two different country codes in those fields.

The results revealed that 460 IP ranges contained a mismatch between the stored country code and the newly evaluated country code. The rest of the IP ranges were in agreement. This result represents $\approx$0.06% of the IP ranges. This is an insignificant percentage of mismatch to create any problems for the consistency of the data. The mismatch could be explained by simple movement of IP ranges between countries since the time of the Botnet and also by the geolocation database being updated with more accurate information over time.

Therefore, external public information from both the IEEE and MaxMind's GeoIP database show that the given data of the Carna Botnet is internally consistent and sound. The analysis so far should provide confidence in the accuracy and consistency of the data.

3 Detailed Analysis

This section will present detailed analysis of each of the fields from the data.

3.1 Manufacturers & MAC Addresses

Most of the analysis relating to manufacturers and MAC addresses has already been performed in the previous sections. Please refer to the previous section

4 802-2001 - IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture http://standards.ieee.org/findstds/standard/802-2001.html

5 GeoLite Free Downloadable Databases http://dev.maxmind.com/geoip/legacy/geolite/

6 geoiplookup(1) Linuxmanpage-http://linux.die.net/man/1/geoiplookup

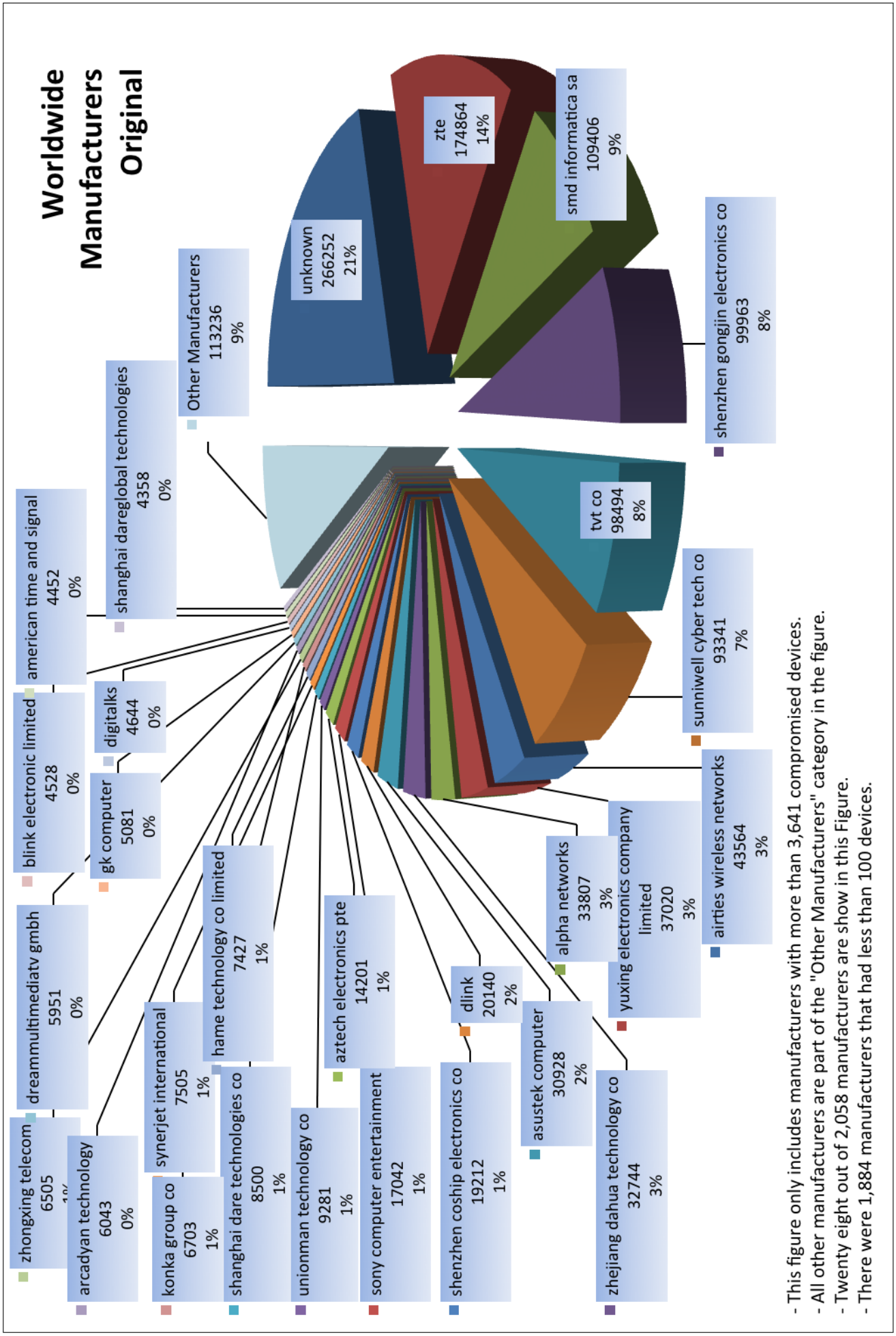


Figure 3: Worldwide Manufacturers - Original

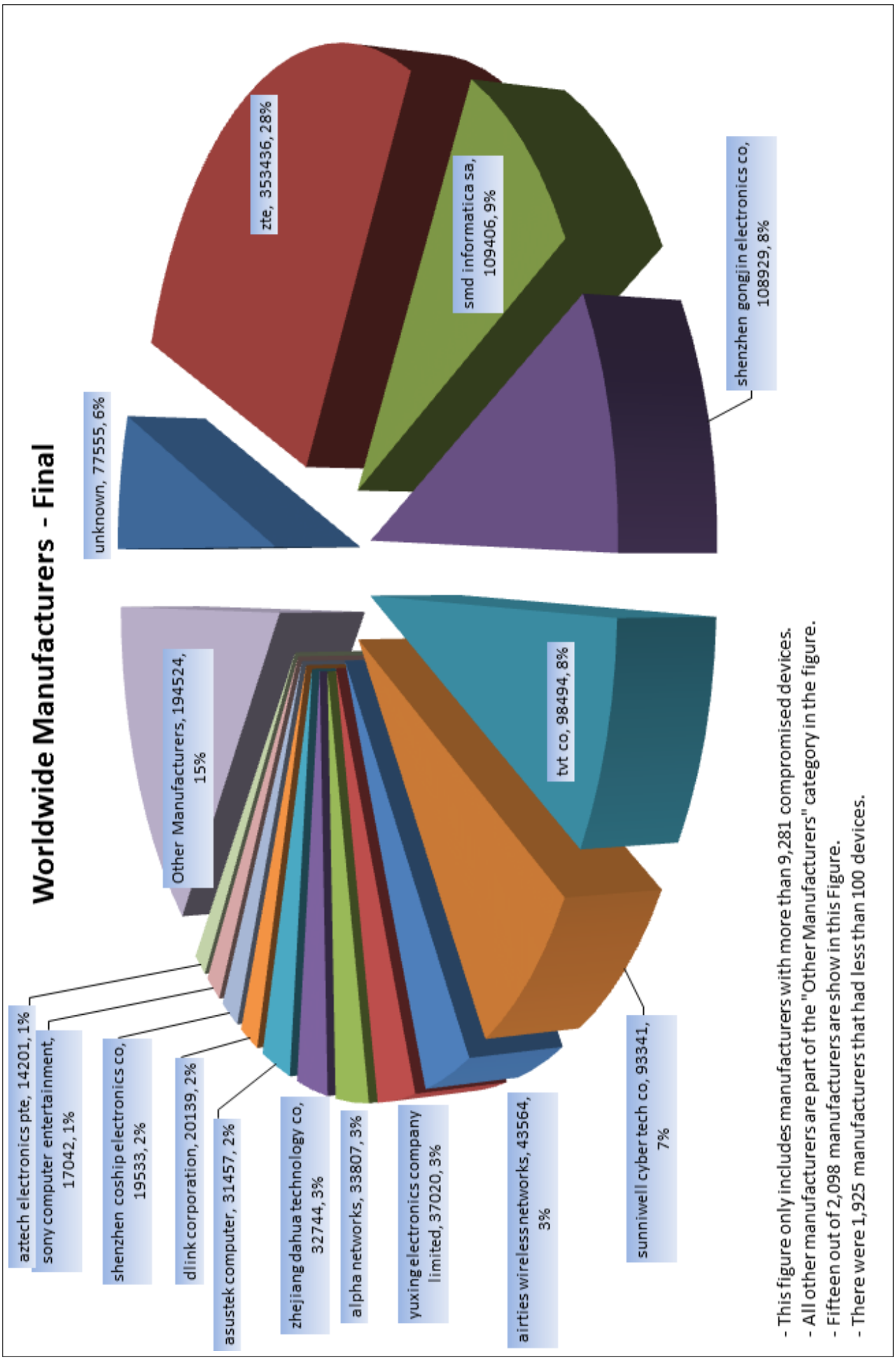


Figure 4: Worldwide Manufacturers - Final

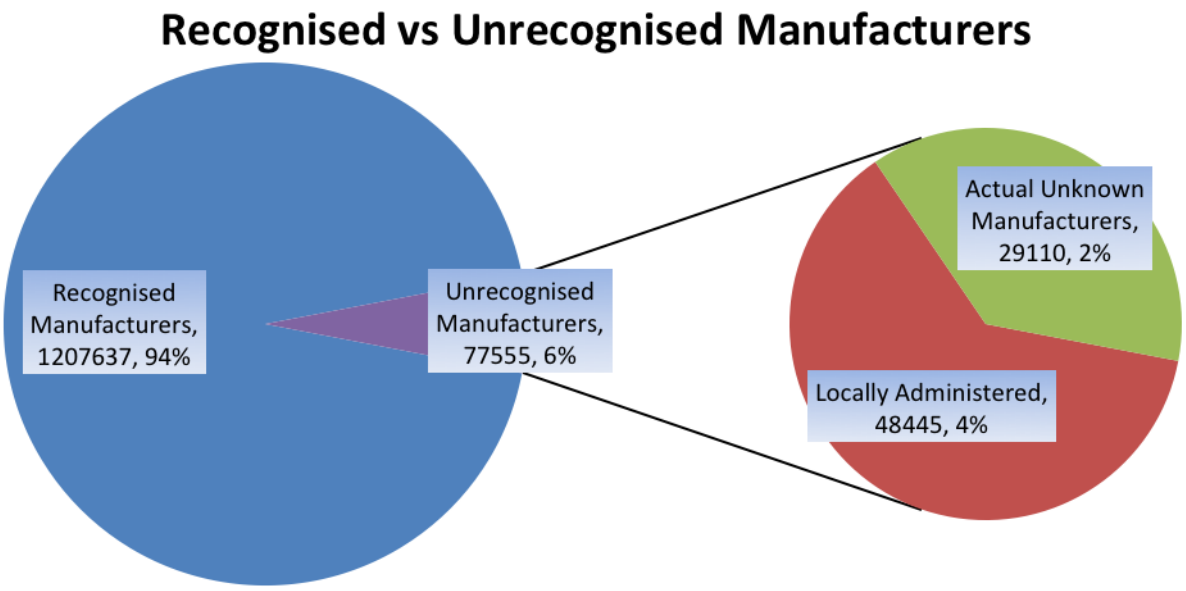


Figure 5: Locally Administered MAC vs Actual Unknown Manufacturer

and Figures 4 and 5 to get an idea on the distribution of manufacturers around the world.

Figure 4 notes an important fact that 1,925 out of the 2,098 manufacturers had less than 100 devices. This seems to indicate that certain manufacturers may be more prominent within the data compared to others. Statistics on the distribution of the number of devices over manufacturers were derived and results are presented below.

Out of the 2,099 Unique Device manufacturers:

- 1,034 manufacturers only have 1 device
- 623 manufacturers have between 2 to 9 devices
- 268 manufacturers have between 10 to 99 devices
- 111 manufacturers have between 100 to 999 devices
- 47 manufacturers have between 1000 to 9999 devices
- 12 manufacturers have between 10,000 to 99,999 devices
- 3 manufacturers have more than 100,000 devices

Figure 6 visually represents these numbers to highlight the worst offending manufacturers.

Only ≈8% of the manufacturers of the compromised devices had more than 100 devices in the data. Considering 100 devices for a manufacturer as an arbitrary division point for the consideration of significance for this report, a combination of the following reasons can be considered to ascertain why certain manufacturers had more records than other manufacturers in this data:

- Devices by certain manufacturers may not allow the change of default logins for telnet.
- A 'backdoor' may be hardcoded into the firmware of these devices with default credentials perhaps to allow for remote diagnostics.
- Lack of documentation by certain manufacturers may not make the owner of these devices aware that the telnet port is even open (this could be true for devices such as CCTV cameras where most people may not realise that telnet is open).
- The device management interface (such as a webserver, management software, or an app) of certain manufacturers may make it difficult for users to find the option to change default credentials.
- Certain manufacturers may make it a requirement for some of these devices to have an internet reachable IP (in the case of CCTV to perhaps allow for remote monitoring).

Any number of the above reasons (and others) could account for why certain manufacturers have more of a presence within the data than others. Manufacturers with less than 100 devices are assumed to be a result of user configuration errors for the purposes of this paper.

A tendency for devices from a limited number of manufacturers to be compromised more than others strongly indicates a wide security problem with the default settings of devices that are manufactured by these companies.

Figures representing the distribution of manufacturers for each of the continents were compiled and can be found in Chapter A on page 563. A complete list of manufacturers with number of devices compromised can be found in Chapter C on page 593.

3.2 Countries & IP Ranges

The Country Code field provides an insight of the distribution of the compromised devices. Figure 7 highlights the distribution of compromised devices across the world in the countries with more than 15,000 com-

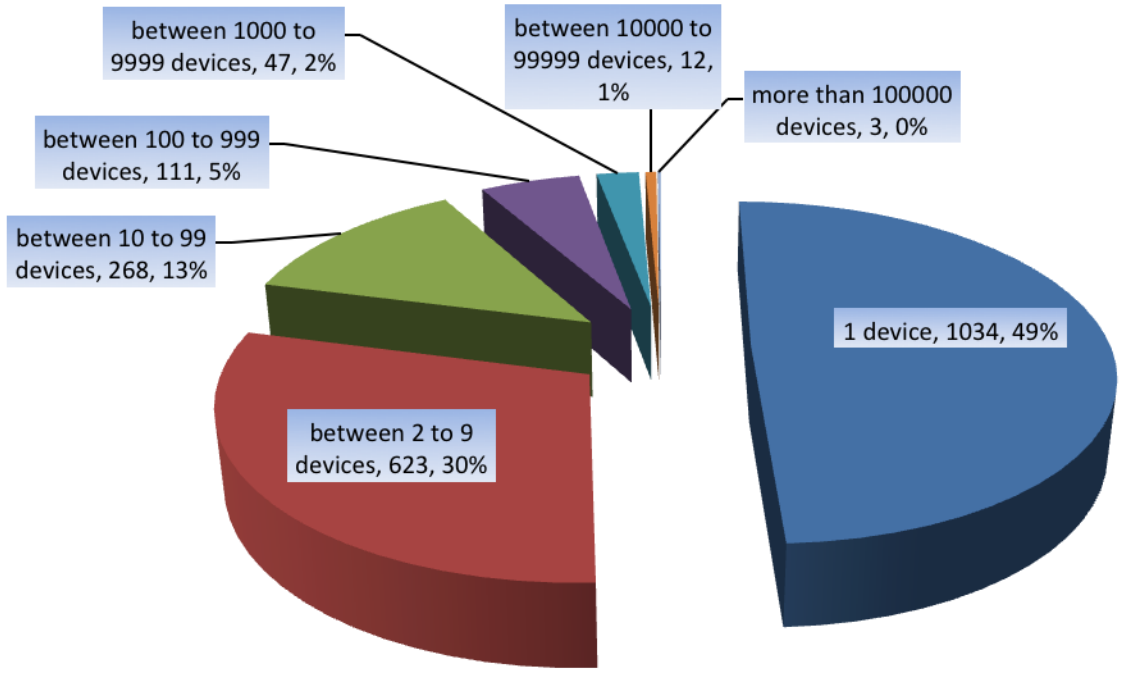


Figure 6: Number of Manufactures with Number of Devices

promised devices. For a complete list of countries, please refer to Chapter B on page 586.

For the purpose of this report, only 10 or more devices for a country will be considered significant. Figures representing the distribution of countries for each of the continents were compiled and can be found in Chapter A on page 563.

It is difficult to analyse why certain countries have more of a presence in the data than others since there are complex and hard-to-answer variables involved in accurately analysing this. The lack of reliable knowledge on the general level of Internet connectivity and bandwidth along with the lack of understanding of the general level of IT user education for each country plays a major role in hindering an accurate analysis in this regard. Speculations of these sorts are left to those within each country with a more intimate knowledge of the workings of the IPv4 Internet in the region.

Out of the 787,665 unique C class IP ranges present in the data, some were observed more often than others. One particular IP range from China was found to be in the records of 1878 different devices. Even though a particular C class IP range can only have maximum of 256 devices at any given time, remember that the Carna Botnet data was collected over a long period of time. This allows for more than 256 devices to be present on the same IP range. This almost guarantees that because of such high repetition, this particular IP range is very likely to have every single one of its IP addresses vulnerable at any given time. Assuming that if a given IP range appears in more than or equal to 260 different records (260 rather than 256 chosen on purpose), it is likely to be highly infested with compromised devices; statistics were created to deduce the countries of the most infested IP ranges. A total of 1308 IP ranges appeared in more than or equal to 260 different records. 829 of these were located in China as shown in Figure 8.

Statistics representing the distribution of the unique IP ranges across the countries were also complied and the results can be seen in Figure 9.

Finally, it is possible to calculate how easy it would be for an interested party to locate vulnerable devices since the information on IP allocation for each country is published by each Regional Internet Registry and global allocations to each registry are published by the Internet Assigned Numbers Authority (IANA).

By dividing the number of compromised devices by the number of allocated IP ranges for each country, the infection ratio of that country can be calculated. This ratio provides a more accurate representation of the prevalence of vulnerable devices in each country.

There are five Regional Internet Registries that are responsible for the allocation of IP addresses in the world[7]. These are: AfriNIC (African Region), APNIC (Asia Pacific Region), ARIN (North American Region), LACNIC (Latin America and some Caribbean Islands) and RIPE NNC (Europe, the Middle East and Central Asia). Under IANA policy, each registry publishes easy to auto-parse information on IP allocations for their region. The publications also contain IPv4 allocations and assignments. The publication contains a list of IPv4 ranges, with the number IP addresses within those ranges that have been allocated to a particular country. The registries also store historical

7 Number Resources http://www.iana.org/numbers

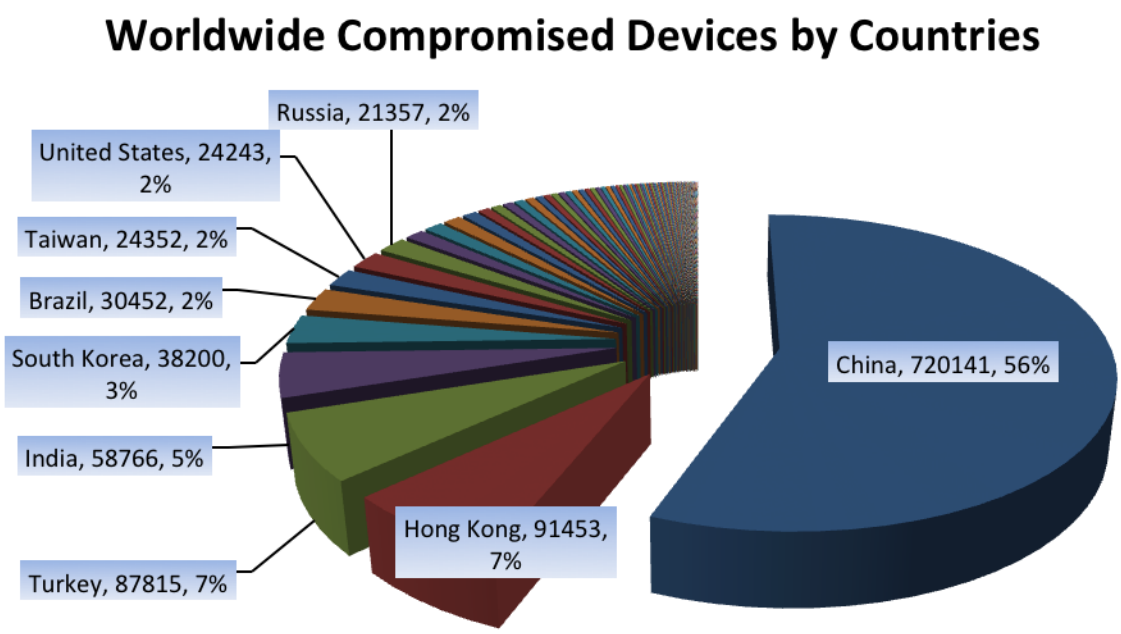


Figure 7: Compromised Devices by Country

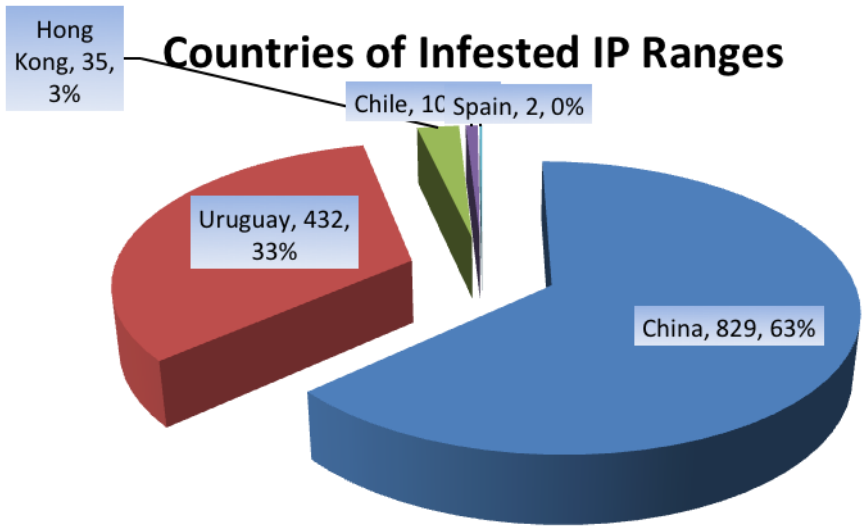


Figure 8: Countries with the number of IP ranges appearing in more than or equal to 260 records

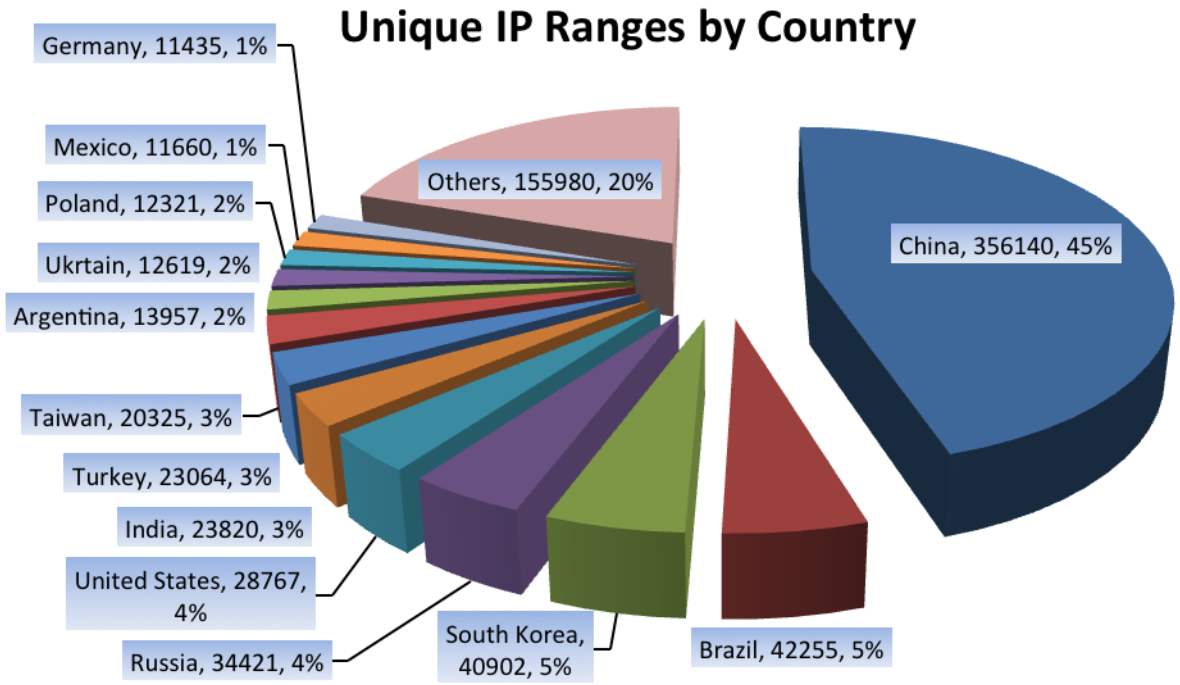


Figure 9: Distribution of number of Unique IP ranges across countries

snapshots of the allocations dating back a decade.

Information from each of the registries, for IPv4 allocations, was downloaded and aggregated to store the number of IPv4 addresses allocated to each country in the world. As a result of the aggregation, IPv4 allocations for 236 countries were stored. Since the Carna Botnet data was collected between August and December 2012, the snapshot of 1 December 2012 was chosen for downloading. This date was chosen arbitrarily as there is no optimal snapshot for best analysis given that the Carna Botnet data was collected over a number of months.

For easier representations, the number of allocated IP addresses for each country was divided by 256 during calculations to convert them into C class IP ranges. A division of the number of infected devices for a country by the number of allocated IP ranges for that country would reveal the infection IP range ratio for that country. Given the dominance of China in the data set thus far, its ratio was calculated first. The ratio for China is 0.56 devices per C Class. This indicates one infected or vulnerable device every ˜1.79 C class subnets or 1 vulnerable device per ˜456 IP addresses. Choosing random IP ranges within China to scan and assuming a scan rate of 10 IP addresses per second, a vulnerable device could be located on average within ˜45.6 seconds.

This analysis paints a more worrying picture than seen so far in the rest of the paper. On further analysis, it was discovered that China did not contain the worst infection ratio in the world. The worst infection ratio was for the country of Curaçao off the Venezuelan cost. A total of 490 devices from Curaçao are present in this data, while a total of only 1024 IP addresses have been officially allocated to the country. This reveals an infection ratio of ˜122.5 per C class or 1 device per 2.09 IP addresses. This seems alarming; however particular care must be taken when deriving meaning from this.

The country information stored in the Carna Botnet represents the physical location of the device as derived by the MaxMind database. However the IP allocations stored by the Regional Internet Registries represent the official allocations for the country. A multi-national company providing Internet service to a smaller country may have bought IP allocations in the country of its headquarters, which might be a neighbour of the small country (in this case Venezuela). In such a scenario, it is highly possible for a country with small IP allocations to end up being assigned IP addresses officially allocated to another country. MaxMind may or may not correctly geolocate such IP address to its correct physical position. Hence, given the high likelihood of this possibility, for countries with small official IP allocations, the infection ratios for such countries cannot be accurately relied upon.

Chapter B on page 586 provides a list of countries with their respective infection ratios.

3.3 RAM

Analysing the distribution of RAM over these devices would provide an indication as to the types of devices compromised. The anonymous researcher has indicated a prominence of embedded devices. An analysis has helped to confirm this. The RAM for each device was grouped between one of the pre-selected RAM

ranges to produce Figure 10. RAM distributions for each continent can be found in Chapter A on page 563 .

Other statistics of interest related to RAM are as follows:

- Unique RAM sizes: 3,880 different RAM sizes
- Lowest RAM: 5,488 kilobytes (5.35 MB) – 1 device in Germany
- 2stnd Lowest RAM: 5,688 kilobytes (5.55 MB) – 1 device in USA
- Highest RAM: 4,828,263,435 kilobytes (4.49 TB) – 1 device in China
- 2nd Highest RAM: 1,000,000,000 kilobytes (0.93 TB) – 5 in China, 1 in Ukraine
- Most common: 11,500 kilobytes (11.2 MB) – 98,947 devices (7.7%)
- 2nd Most common: 124,620 kilobytes (121.7 MB) – 96,543 of devices (7.5%)

3.4 Uname

A quick analysis revealed the results shown in Figure 11. With 80% of devices having an 'unknown' uname, it is not possible to perform any valuable analysis of this field.

3.5 CPU Info

An analysis of the CPU Info field proved difficult due to lack in the consistency of the stored values. The output of /proc/cpuinfo differs for different architectures, manufacturers and firmware. As a result, finding consistency in the field proved difficult and too time costly to be included in this research paper. If future analysis reveals any interesting trends in this field then these may be published in an updated version of this research paper.

However, the CPU info field is more aptly analysed by the respective manufacturers of the devices to help identify the exact models of each of the compromised devices. As detailed in the section 'Call to Arms & Conclusion', AusCERT invites the more prominent manufacturers detailed within the data to liaise with us to reduce the potential security impacts of the Carna Botnet.

4 Detection and Removal

This paper provides detailed information on what can be looked for when searching for a vulnerable device. However it is important to note that even after locating a device that may be vulnerable to the Carna Botnet attack, there is no guaranteed method of checking if the device has been compromised or is actually vulnerable to compromise.

LightAidra is designed to auto-search telnet ports and attempt to auto-compromise them with default credentials. It allows you to upload a custom binary that can be programmed to do anything, including but not limited to, send spam, relay illegal materials and sniff and modify all passing traffic. Therefore, not much work is required to start a botnet with LightAidra. The anonymous researcher notes finding devices with LightAidra infections on them. It seems that LightAidra came about independently of the Carna Botnet a few months after the anonymous researcher started his/her project. Given the existence of other botnets started by LightAidra, the Carna Botnet may not represent the complete list of vulnerable devices; there may be many more.

Furthermore, the anonymous researcher indicated that s/he did not scan internal networks (private ranges) for vulnerable devices whenever a gateway router was compromised by the Carna Botnet. It is highly likely that many more vulnerable devices are hidden behind NAT within the private IP ranges of internal networks.

A characteristic of LightAidra is to close the telnet port on infection. The primary reason for this is to prevent interference by other botnets, however this also prevents device owners from checking to see if the device is vulnerable or has already been compromised. Maybe the telnet port is just closed by default or maybe the device has been compromised and the malware has closed the port. One effective way to clean a device is to perform a hardware reset. However, this does not provide any guarantee that a device will indeed be clean of any custom binaries that may have been uploaded by tools such as LightAidra. Since telnet drops users into a root shell on most devices and many devices allow modifying system essentials, it is possible for a custom binary to infect a device such that the infection would remain even upon a hardware reset.

The detection and removal of vulnerable and infected devices is still a difficult problem. If shell access into a device via SSH is possible then a manual attempt to locate the infections can be made and a device declared clean after a thorough search. However, if telnet was the only possible shell into the device and a hardware reset does not re-open the telnet port then the device should be considered lost. It is possible, depending on the device, to download fresh firmware from manufacturer and perform an external firmware flash to begin fresh. However, this may not always be possible or easy to perform depending on the device and its functionalities.

Nonetheless, for most embedded devices their partitions are usually mounted as read-only with write permissions to folders such as tmp which are stored in RAM. This means that for most infections a reboot of the device would remove the infection from RAM and clean the device. This may potentially leave the telnet port closed! The custom binary may have modified start up scripts, for devices that support it, that would re-infect the device. However in most scenarios, a reboot should clean a device.

Given these difficulties, a multi-level plan of attack involving all different players of the industry, including

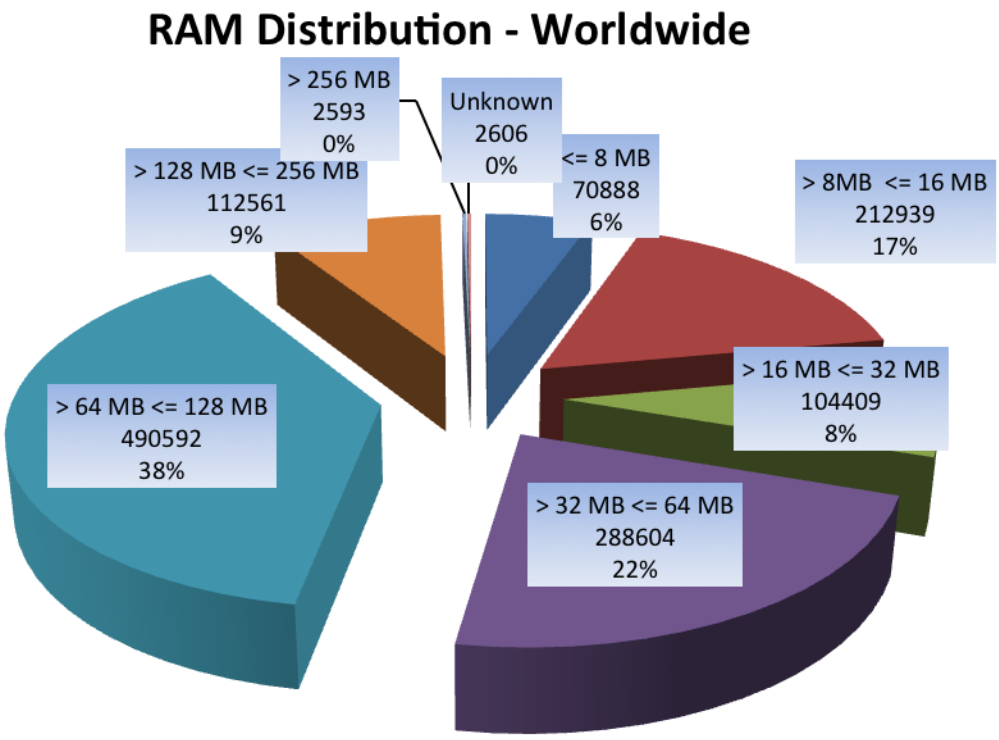


Figure 10: Distribution of RAM - Worldwide

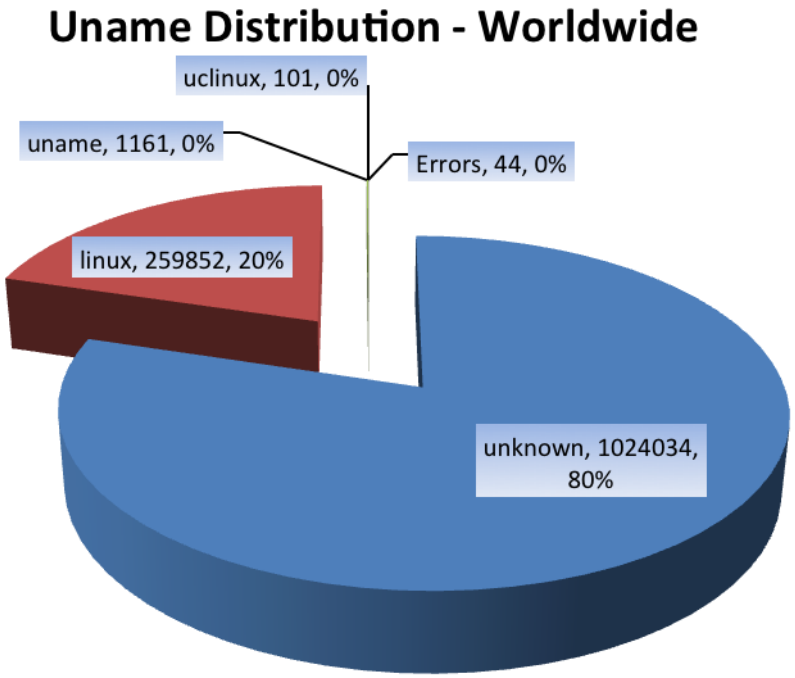


Figure 11: Distribution of Unames

manufacturers, ISPs and end users is required to resolve the problem of default credential login via telnet for the future safety and security of the Internet.

5 Call to Arms & Conclusion

Given the problems highlighted in the previous section and throughout this paper, we invite researchers, manufacturers, CERTS and other interested parties around the world to work together with AusCERT in reducing the problems highlighted by the Carna Botnet.

AusCERT recognises that there may be CERTs or equivalent organisations for each country that may possess the required knowledge to accurately analyse the data relevant to their country. AusCERT has notified and provided the relevant data to organisation(s) for countries with more than 10,000 records and others on request. Other relevant organisations from around the world are welcome to contact AusCERT to request the raw data relevant to their country for analysis or research. As the data contains sensitive information, AusCERT will assess the relevancy of the organisation making the request before providing any data. When making a request please ensure that your organisation's PGP key or similar method is provided to obtain the data, as it will be encrypted before being sent.

Furthermore, the manufacturers that are more prevalent in this data are invited to contact AusCERT. A sanitised copy of the relevant data can be provided to interested manufacturers to analyse and deduce the reasons behind their prevalence in the data. The hope is that required manufacturing processes can be identified and changed to ensure future devices are not sold with this inherent security flaw.

ISPs and resellers of these devices also need to play a critical role in ensuring that vulnerable devices are not resold by them to their customers which can place their own networks in jeopardy upon infection. Once infected, a device can have a negative impact on network performance for ISPs and as such an incentive to not sell these vulnerable devices should be plainly obvious.

Finally, end users need to play a pivotal role in demanding the devices they buy to be secure by default. CERTs, manufacturers and ISPs can play a role in educating end users to secure their existing devices and ensure all future devices bought can be guaranteed to be secure by default by the manufacturers or reseller.

In conclusion, there is no magical method to eradicate all the vulnerable devices easily and quickly. A long term dedication along with a willingness to modify current practices from all industry players involved is required to remove these devices from circulation on the IPv4 Internet over the coming years.It is quintessential that more and more people know about the seriousness of the issues highlighted in this paper and we encourage everyone reading to please spread the word.

6 About the Author

Parth Shukla is an Information Security Analyst in the Operations Centre at the Australian Computer Emergency Response Team (AusCERT). He specialises in providing analysis, monitoring threats and responding to member requests for incident handling. Parth has extensive experience working in the IT field over the past 8 years. He has worked for the University of Queensland (UQ) for a number of years taking on various positions. In addition to working as the Information Technology Support Officer at the UQ Library, he has also held a range of Research Assistant roles in various IT projects, and he has tutored both practical programming and other theoretical computer courses at both advanced and capstone levels for the School of Information Technology and Electrical Engineering (ITEE). Parth's previous roles outside the University include working as a system administrator and a freelance website programmer. In terms of academics, he has excelled in his studies, being awarded the prestigious "UQ Excellence Scholarship", which he maintained for the full 4 years.

While at AusCERT, Parth has been analysing the data of the Carna Botnet that he obtained exclusively from the anonymous researcher. He has provided relevant snippets of the datasets to CERTs around the world as well as relevant organisations within Australia. He has taken on the mission of spreading public awareness on the security implications of his research by conducting detailed region-specific analyses of the Carna Botnet at various conferences around the world. So far, Parth has presented at the following conferences: BlackHat in Sao Paulo, Brazil; DeepSec 2013 in Vienna, Austria; The Hackers Conference in Delhi, India; APNIC 36 in Xi'an, China; AusNOG 2013 in Sydney, Australia; AusCERT Security on the Move Conference in Sydney and Brisbane, Australia; and AusCERT 2013 Conference at the Gold Coast, Australia.

Parth has been strongly interested in information security from the earliest days of his career. His passion for computer security covers a wide range of topics from botnet and malware analysis to network and infrastructure security. Outside work, Parth also runs his own small VM farm of servers at home as a hobby and for private research. His personal interests are far and wide, including physics, politics, religion, philosophy and cricket!

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Twitter: http://twitter.com/pparth

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A Extra Figures

This appendix contains all the extra Figures as mentioned throughout the different sections in the research paper.

For the purposes of creating statistics and visual representations, MaxMind's 'ISO 3166 Country Codes with Associated Continent' was used to associate countries with their respective continents. This was acquired from: http://dev.maxmind.com/geoip/codes/country_continent

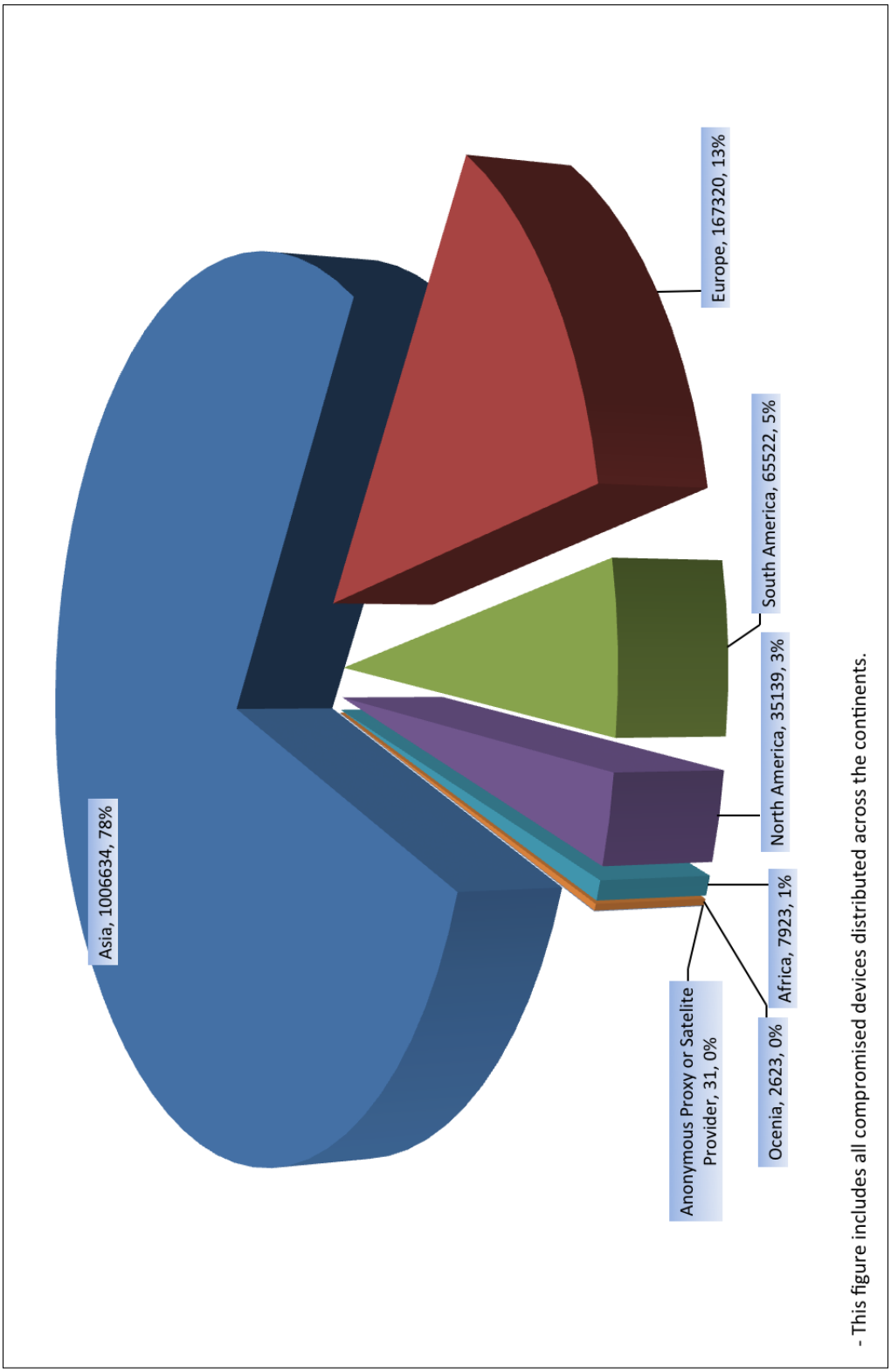


Figure 12: Device Distribution by Continents

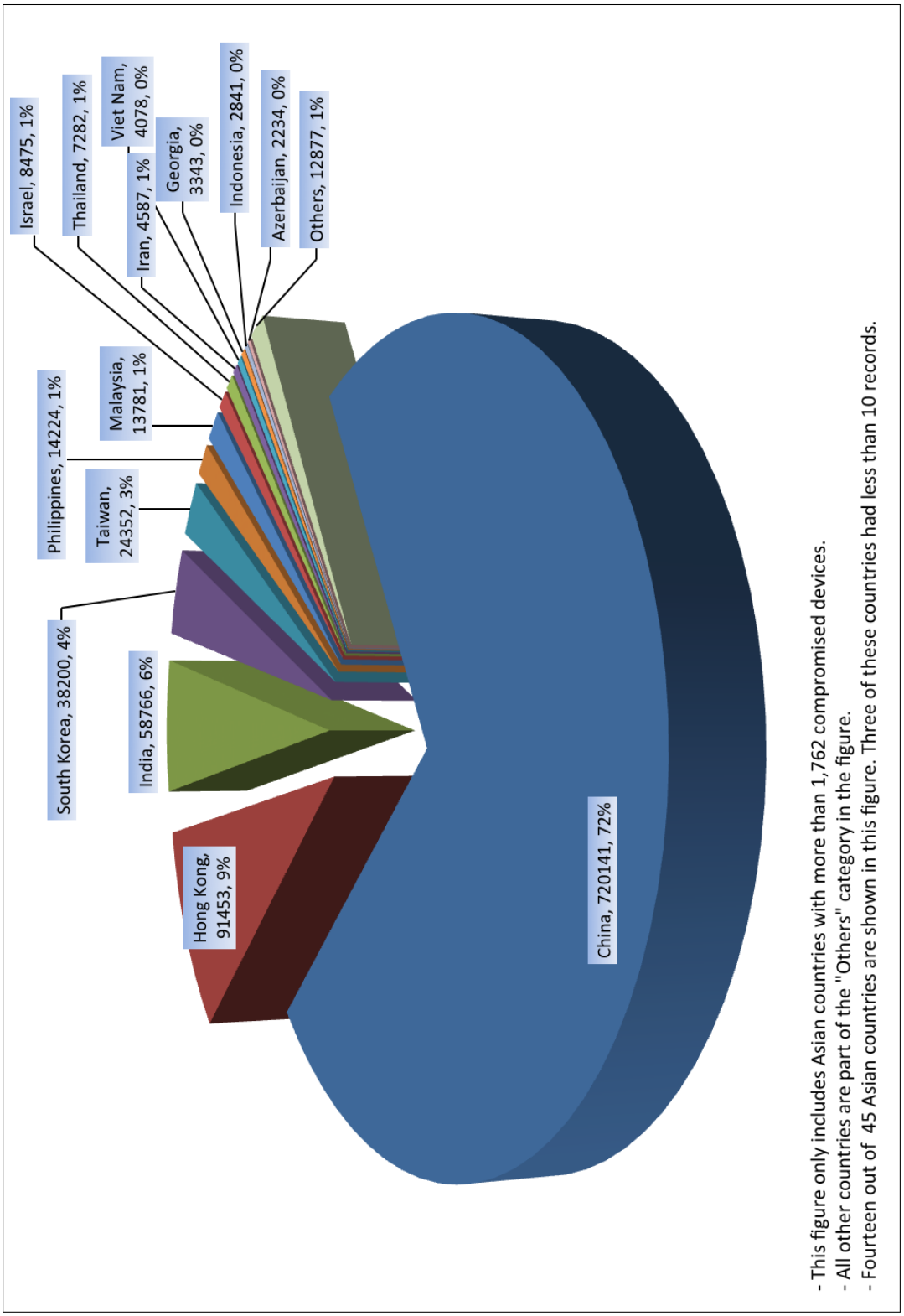


Figure 13: Asia – Device Distribution by Countries

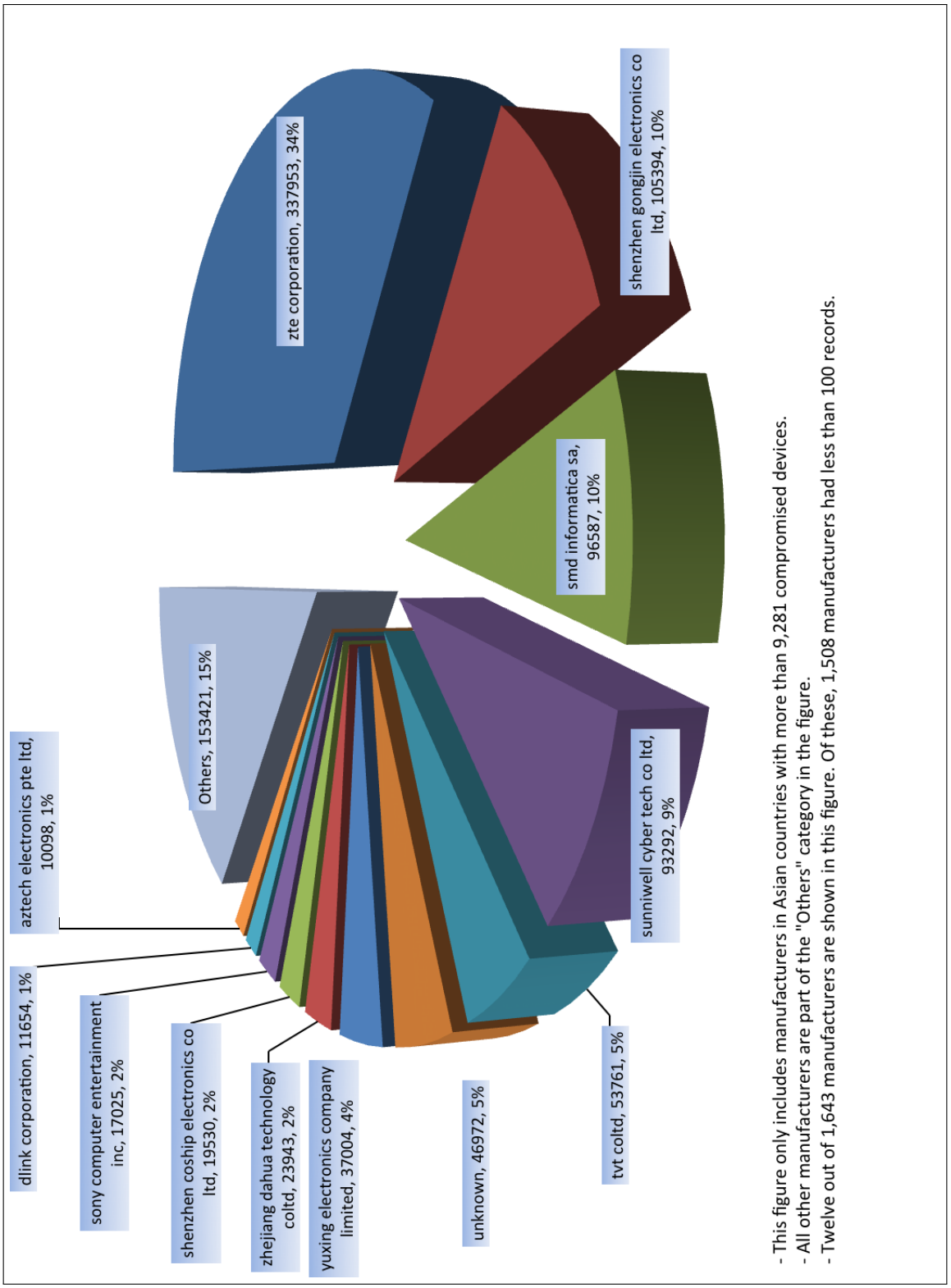


Figure 14: Asia – Device Distribution by Manufacturer

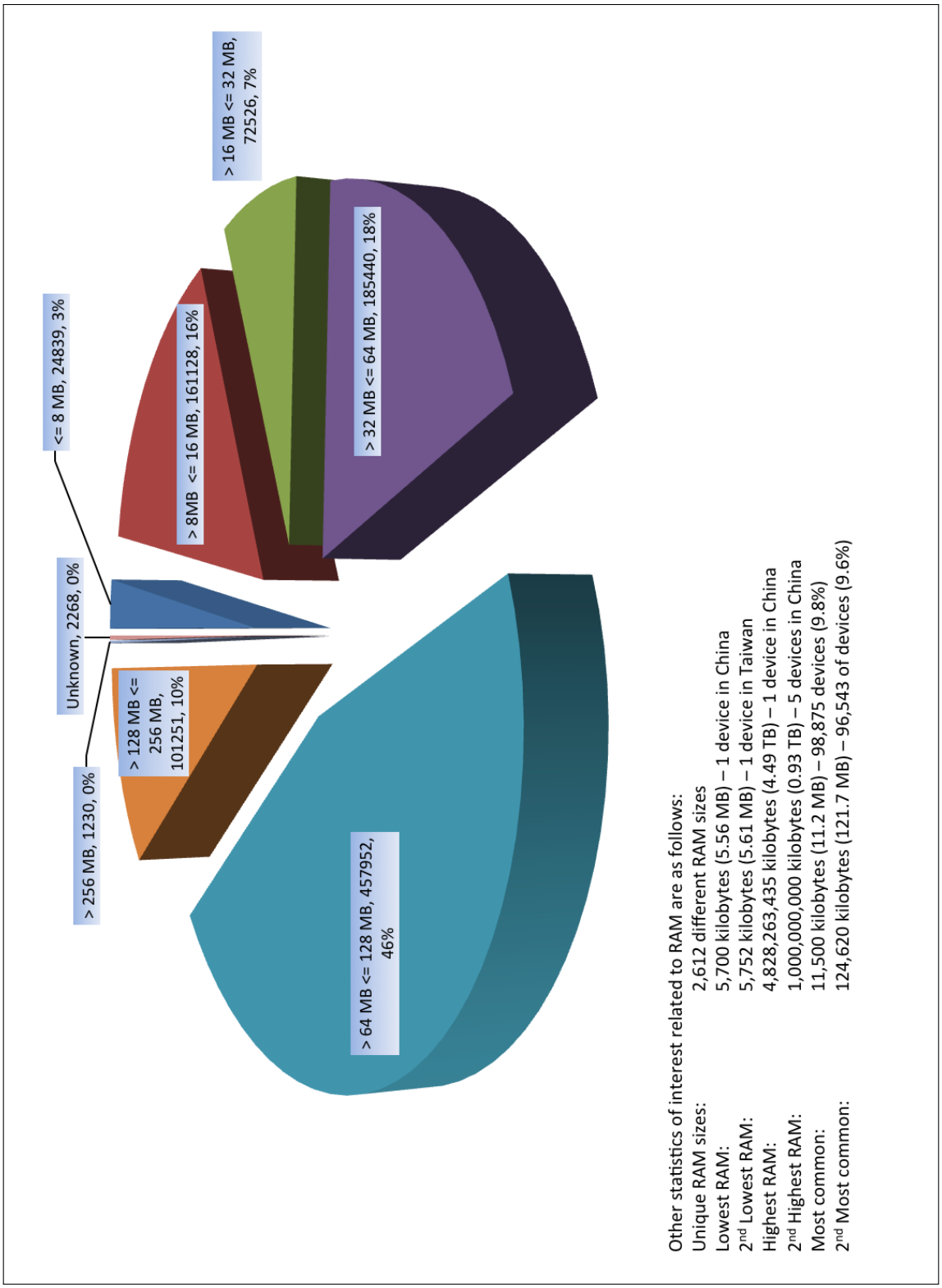


Figure 15: Asia – RAM Distribution of Devices

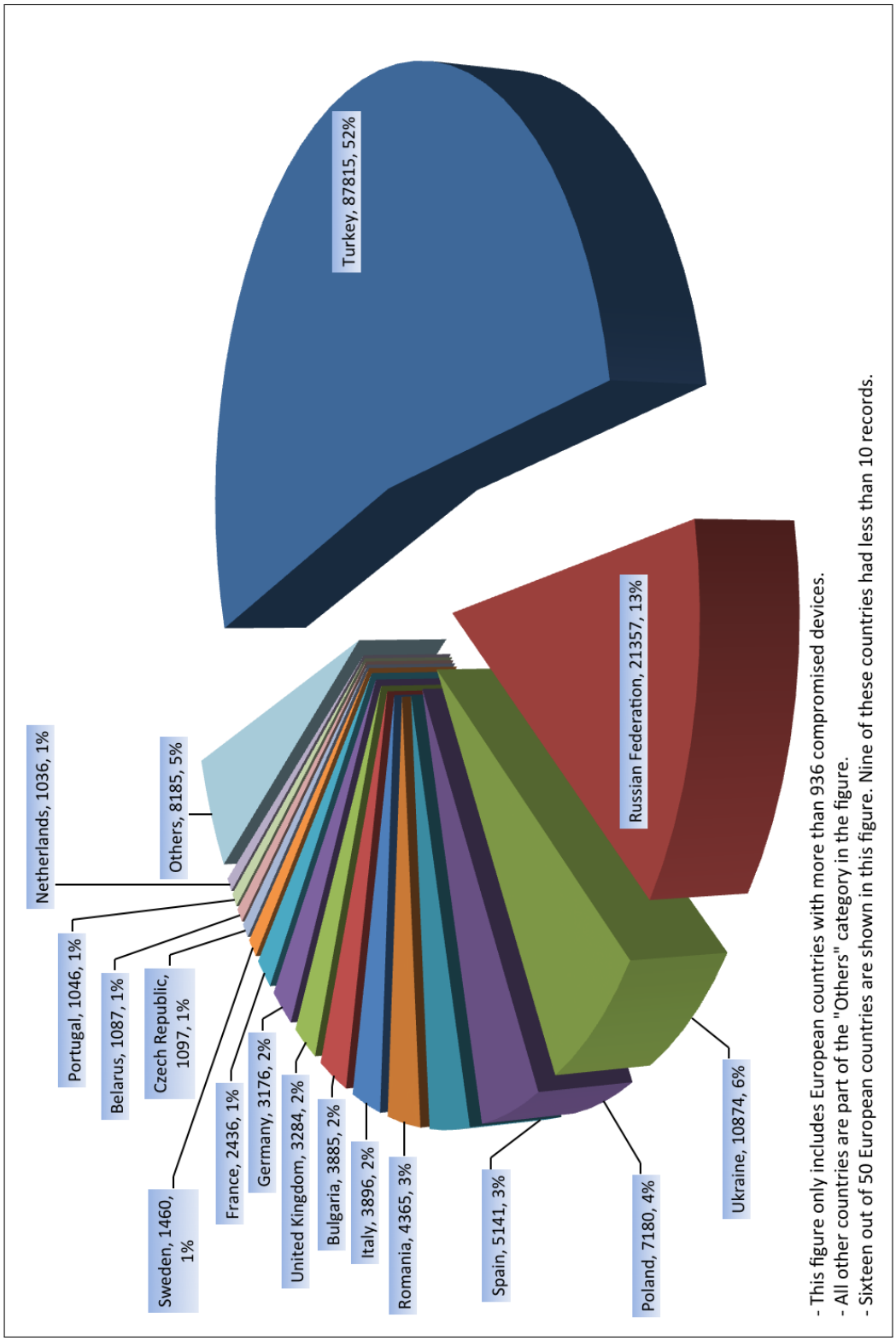


Figure 16: Europe – Device Distribution by Countries

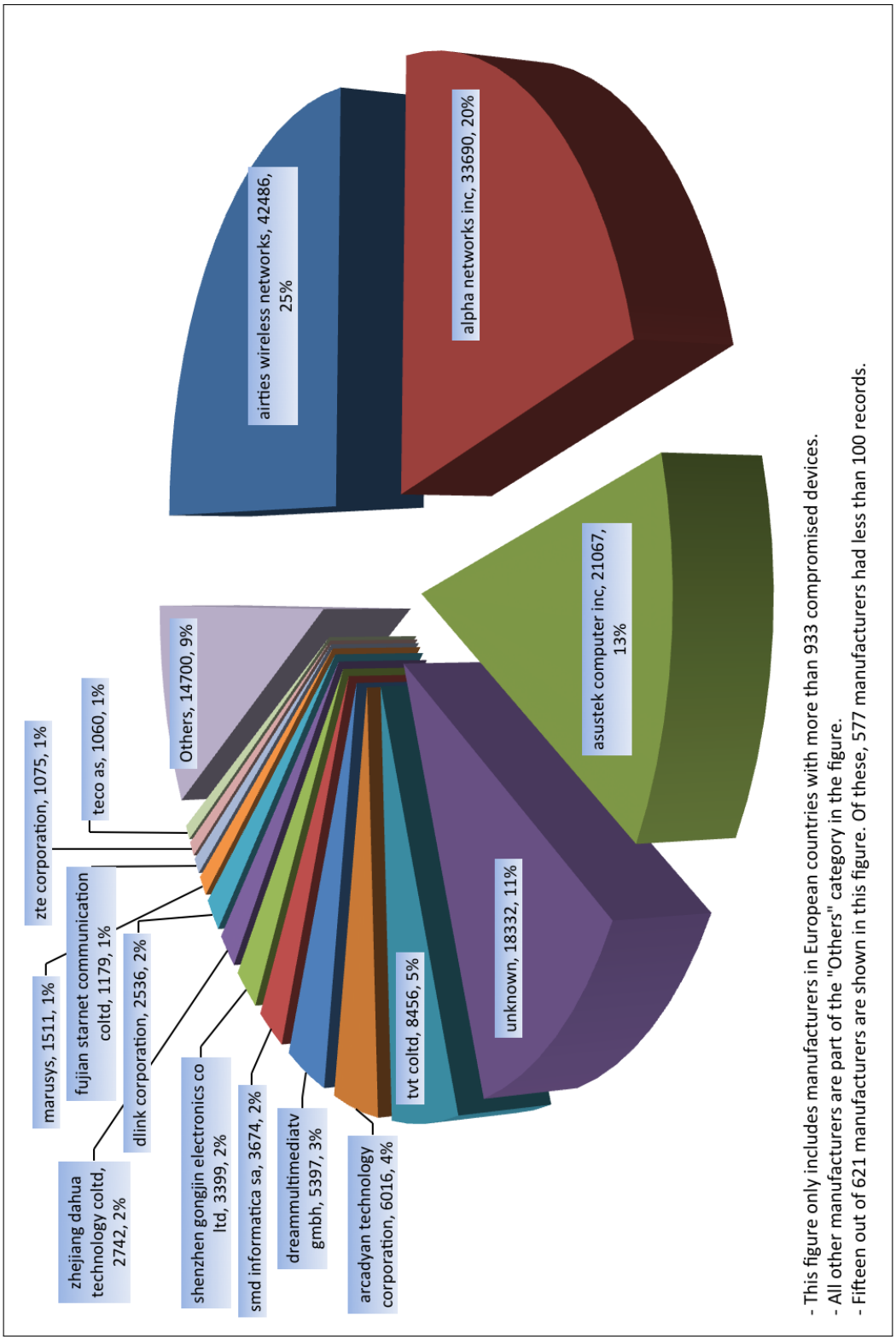


Figure 17: Europe – Device Distribution by Manufacturer

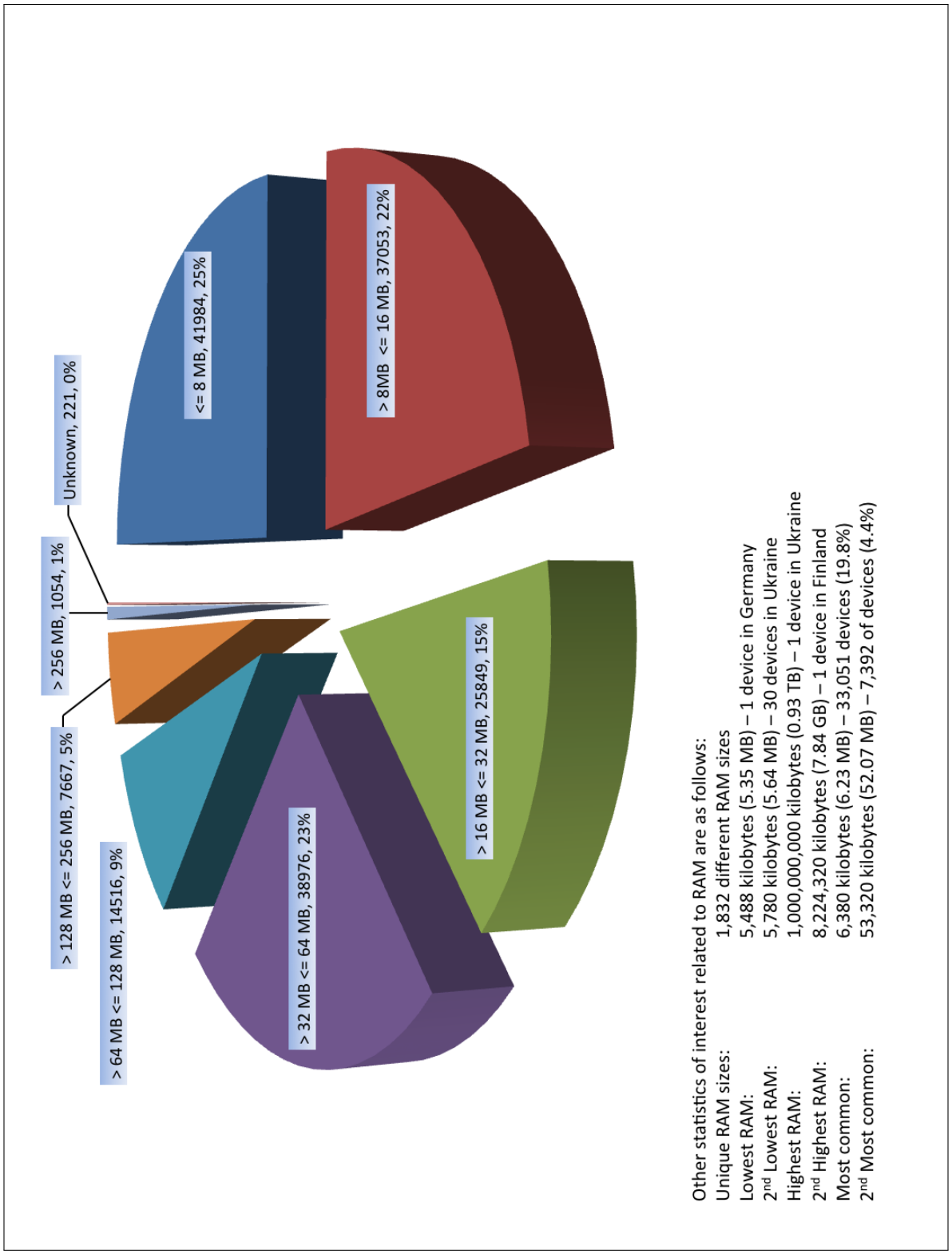


Figure 18: Europe – RAM Distribution of Devices

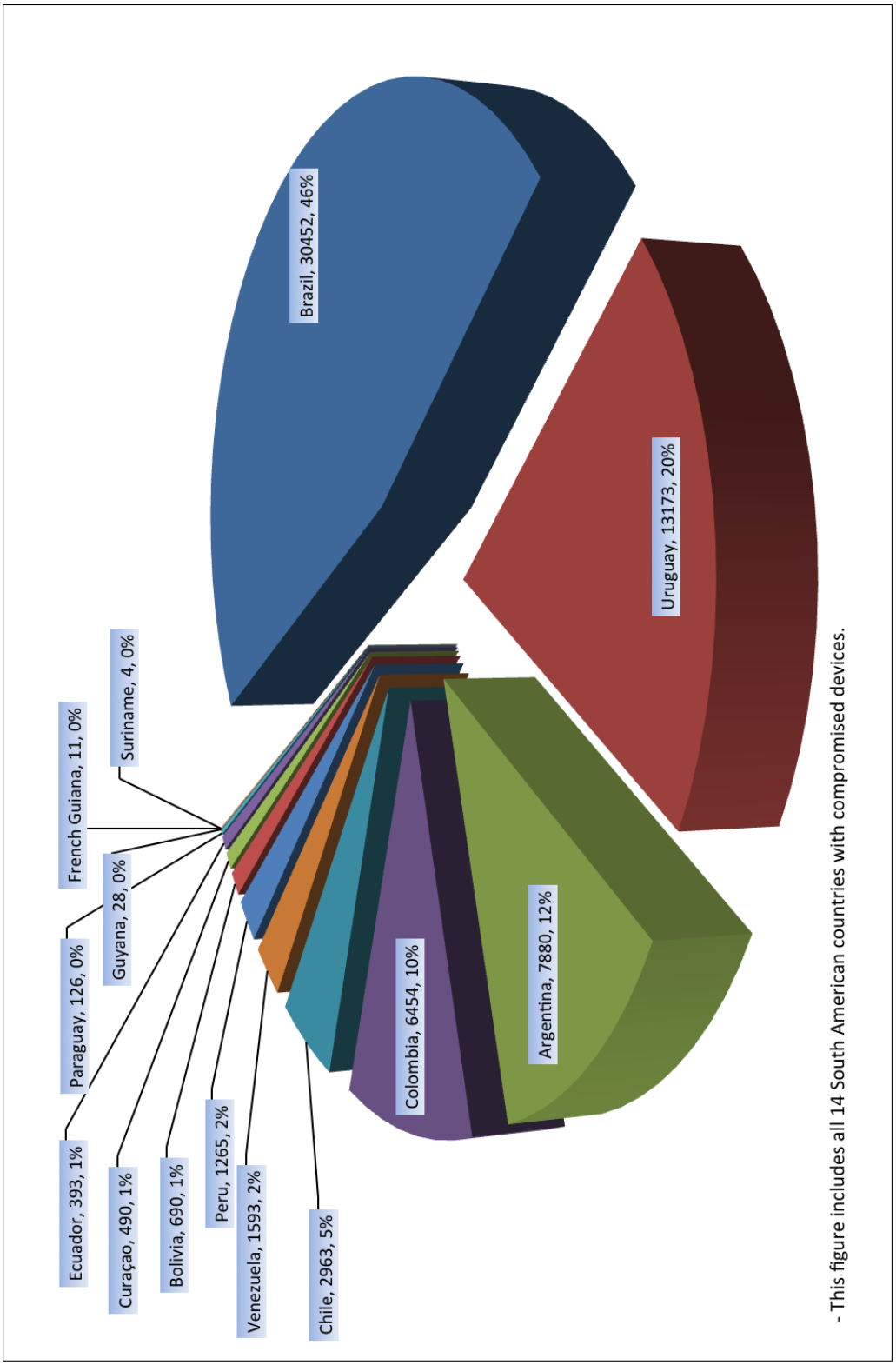


Figure 19: South America – Device Distribution by Countries

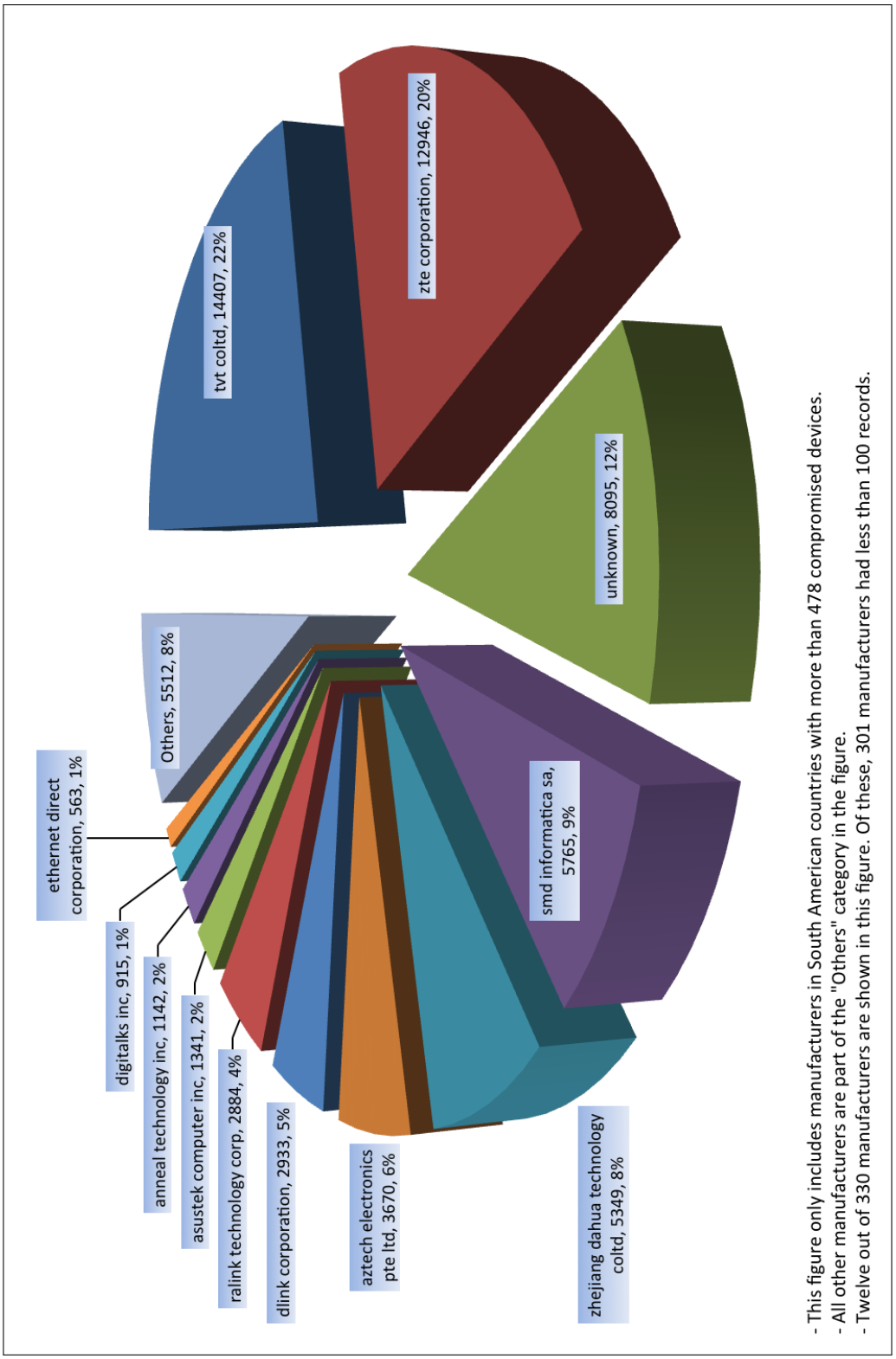


Figure 20: South America – Device Distribution by Manufacturer

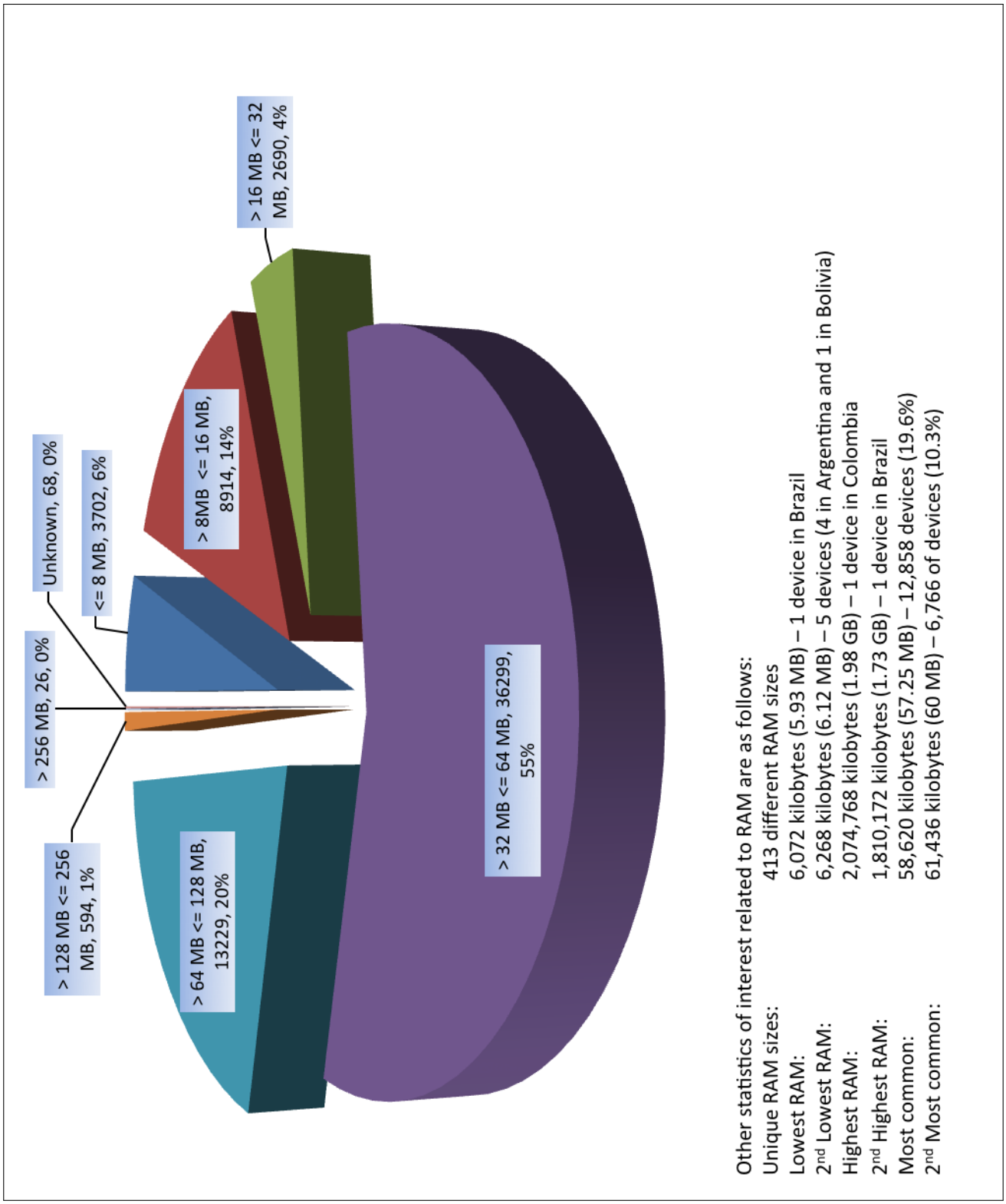


Figure 21: South America – RAM Distribution of Devices

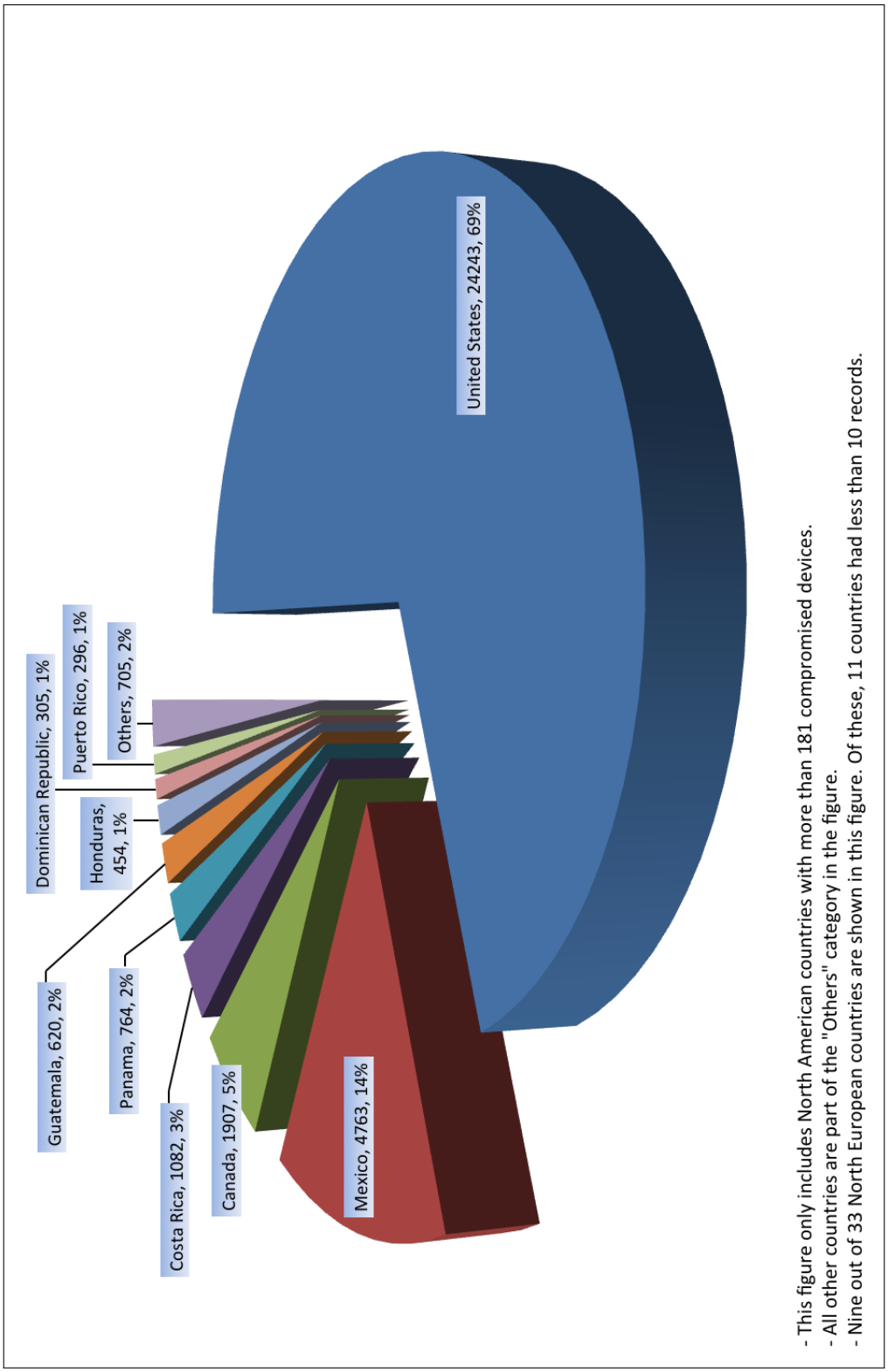


Figure 22: North America – Device Distribution by Countries

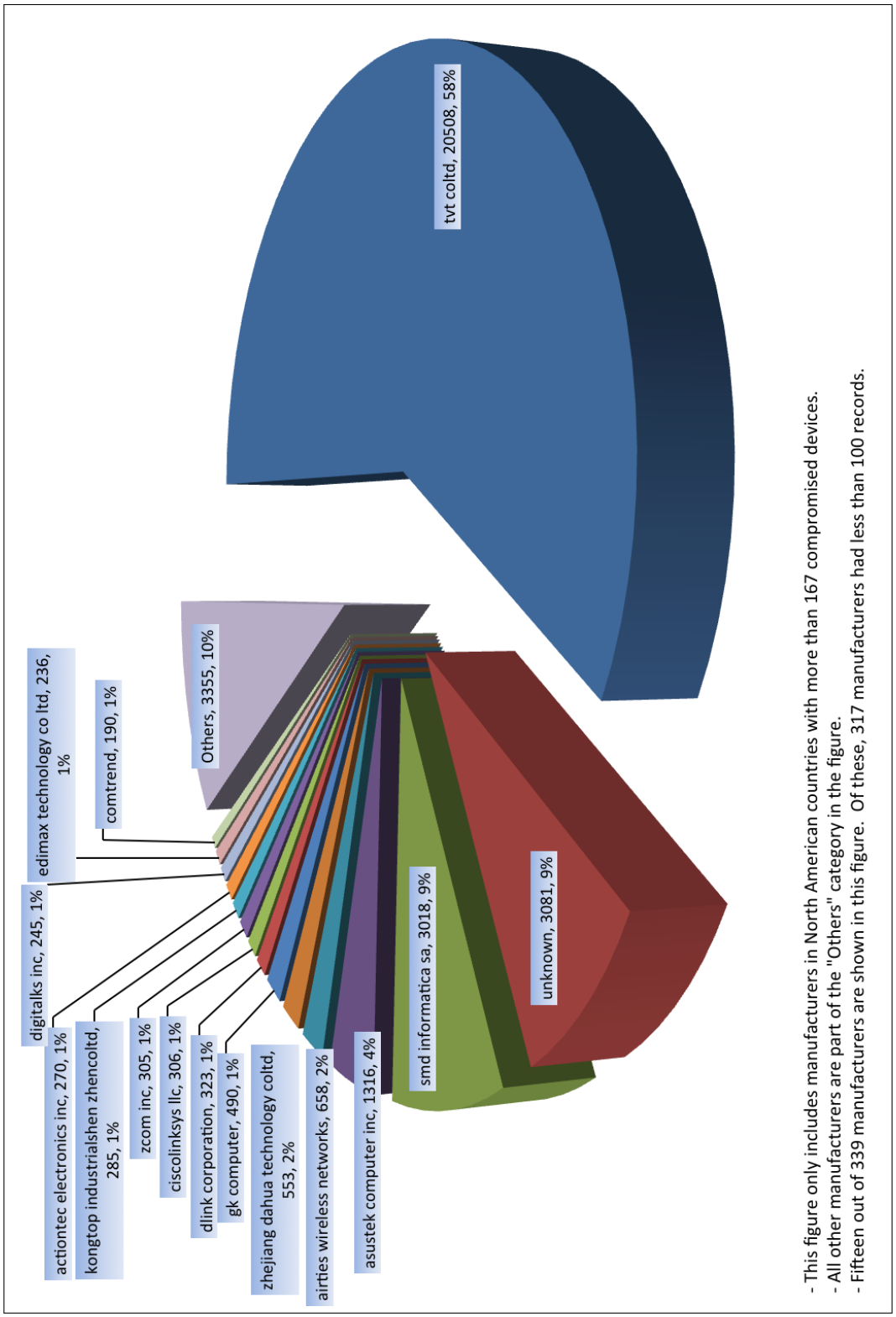


Figure 23: North America – Device Distribution by Manufacturer

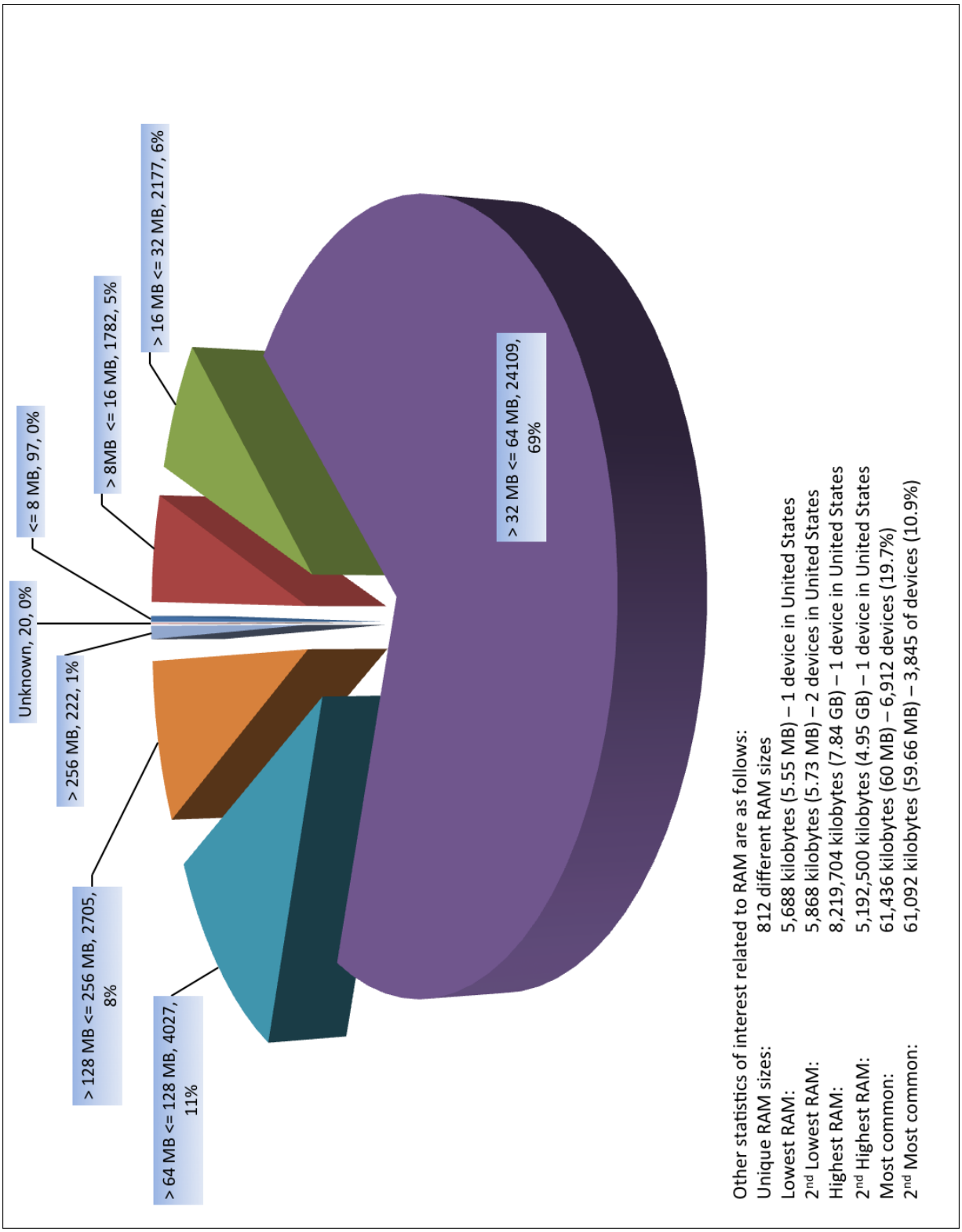


Figure 24: North America – RAM Distribution of Devices

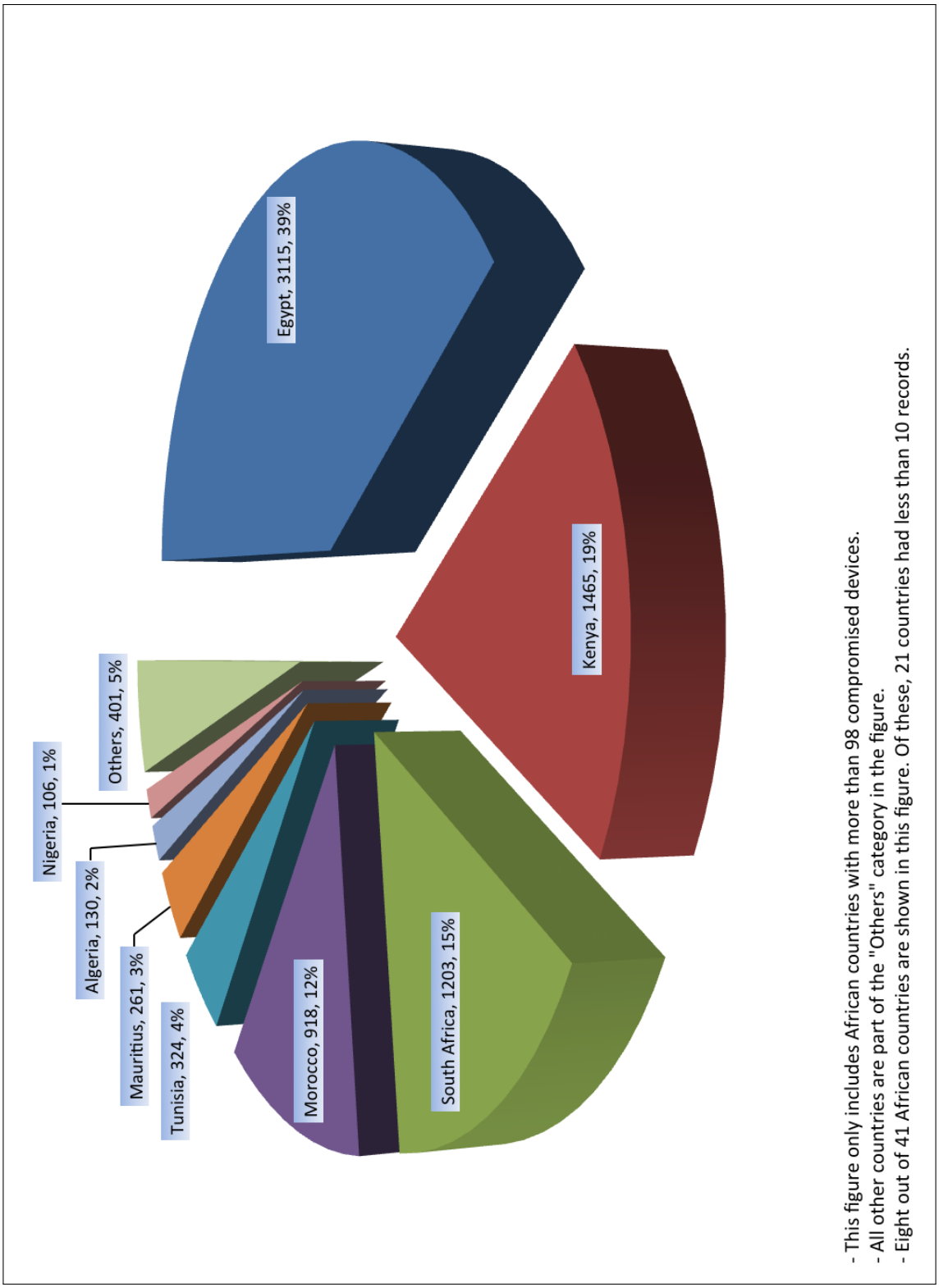


Figure 25: Africa – Device Distribution by Countries

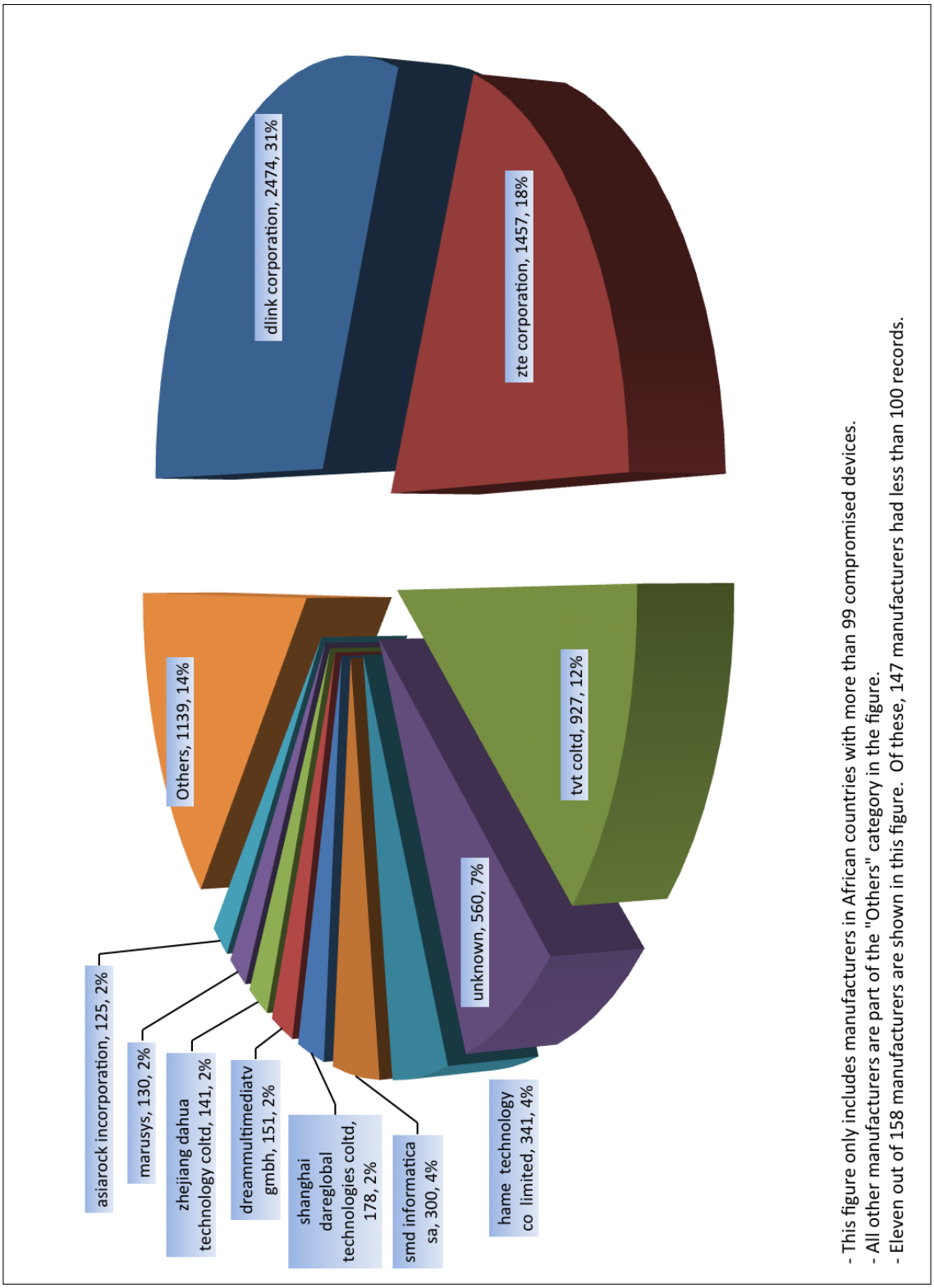


Figure 26: Africa – Device Distribution by Manufacturer

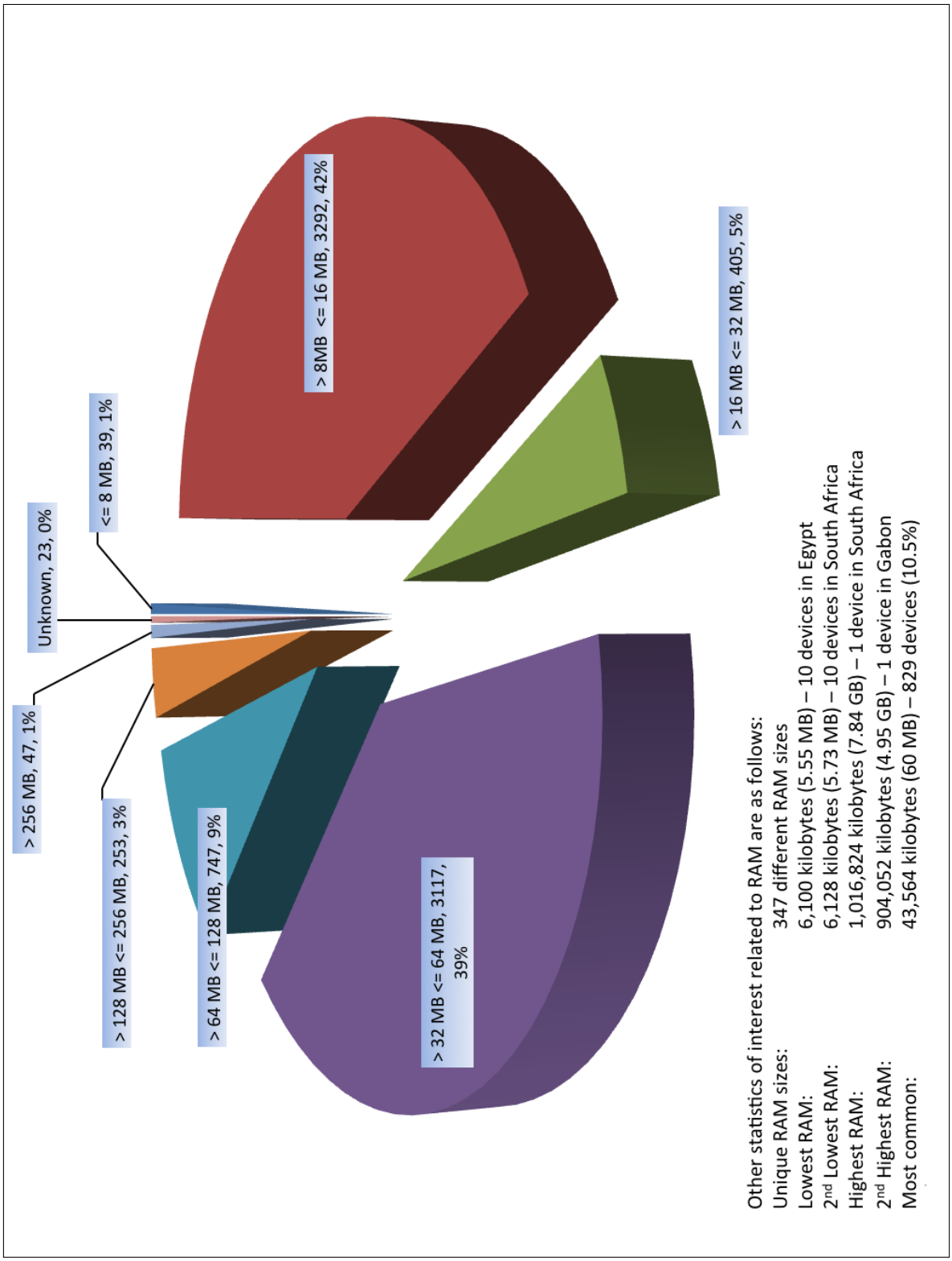


Figure 27: Africa – RAM Distribution of Devices

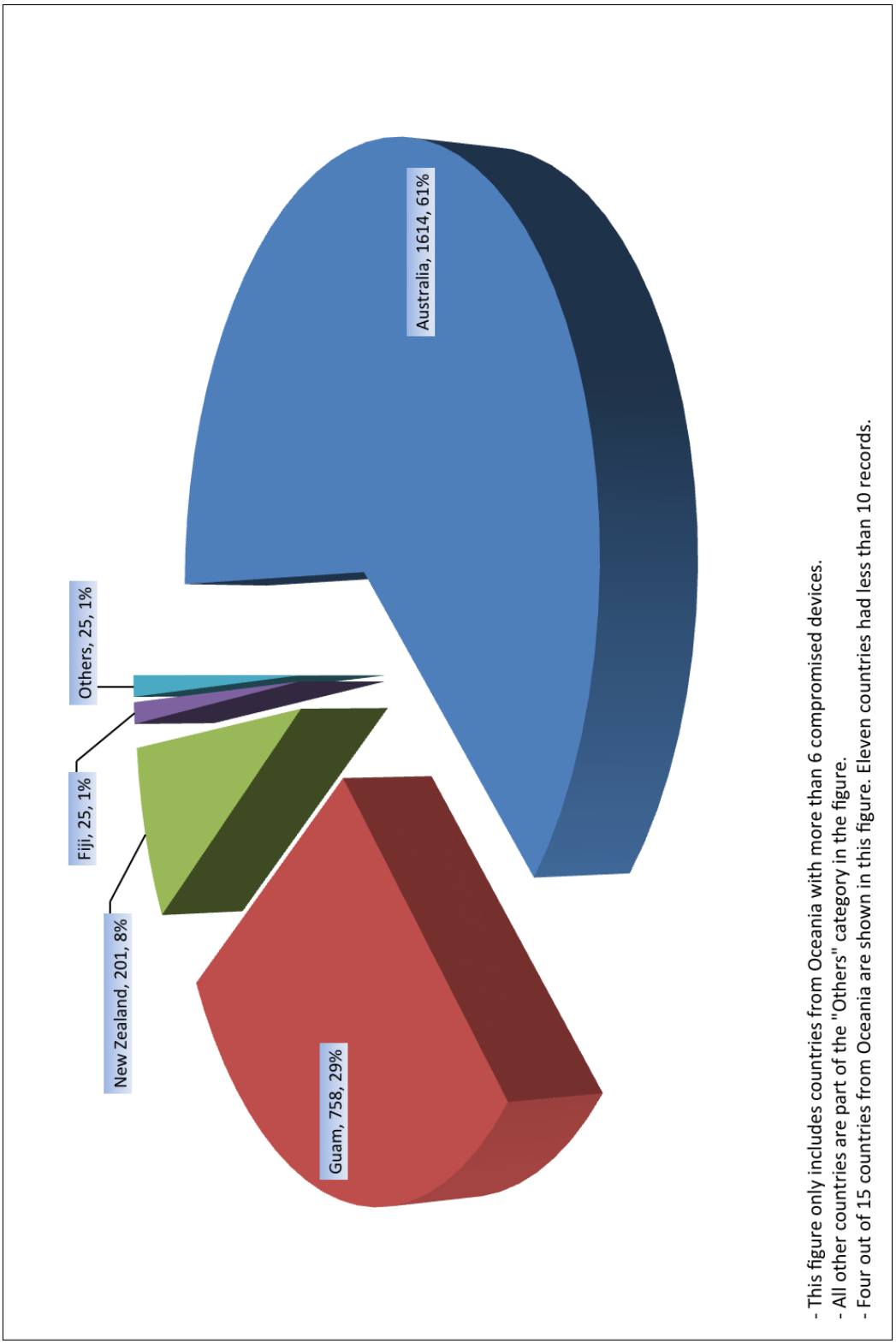


Figure 28: Oceania – Device Distribution by Countries

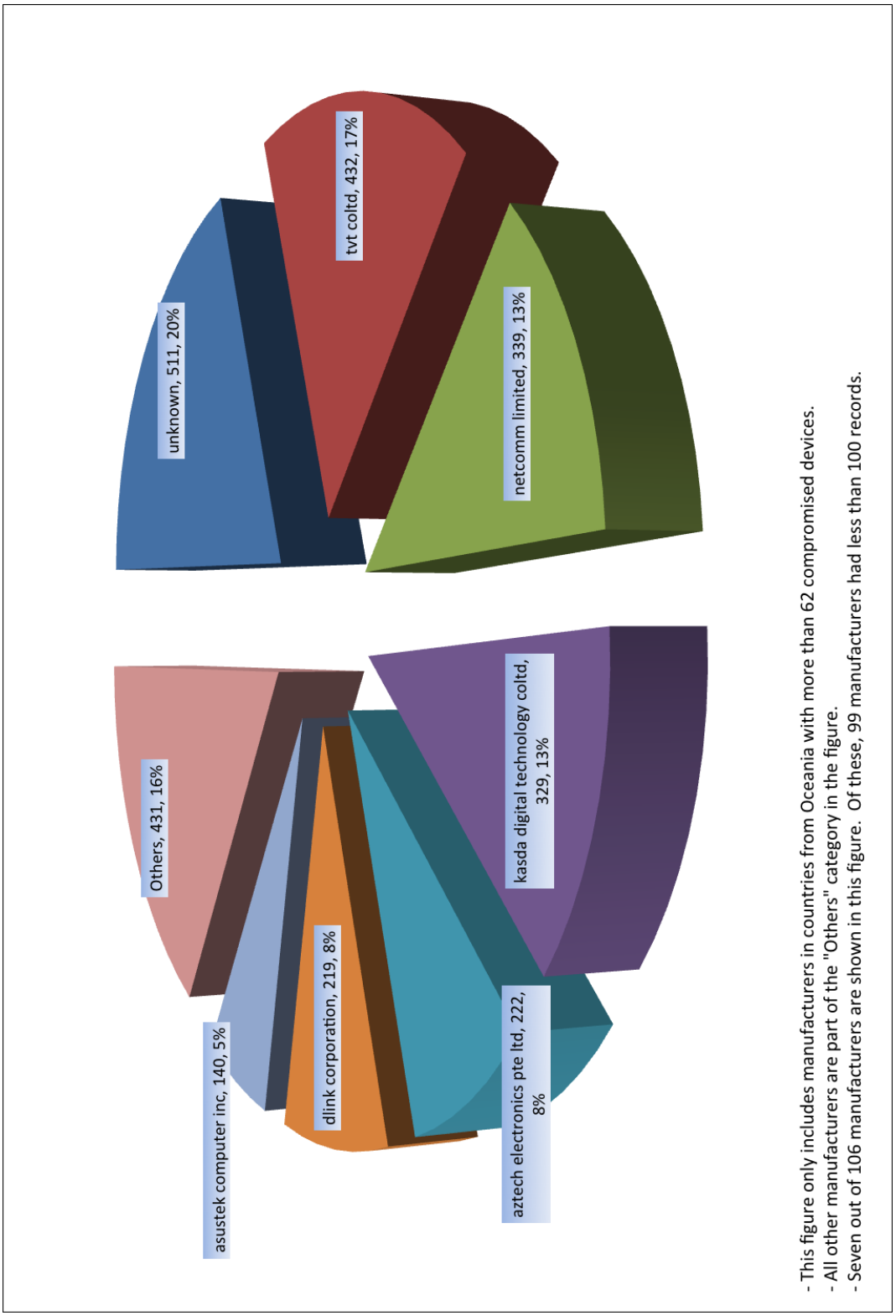


Figure 29: Oceania – Device Distribution by Manufacturer

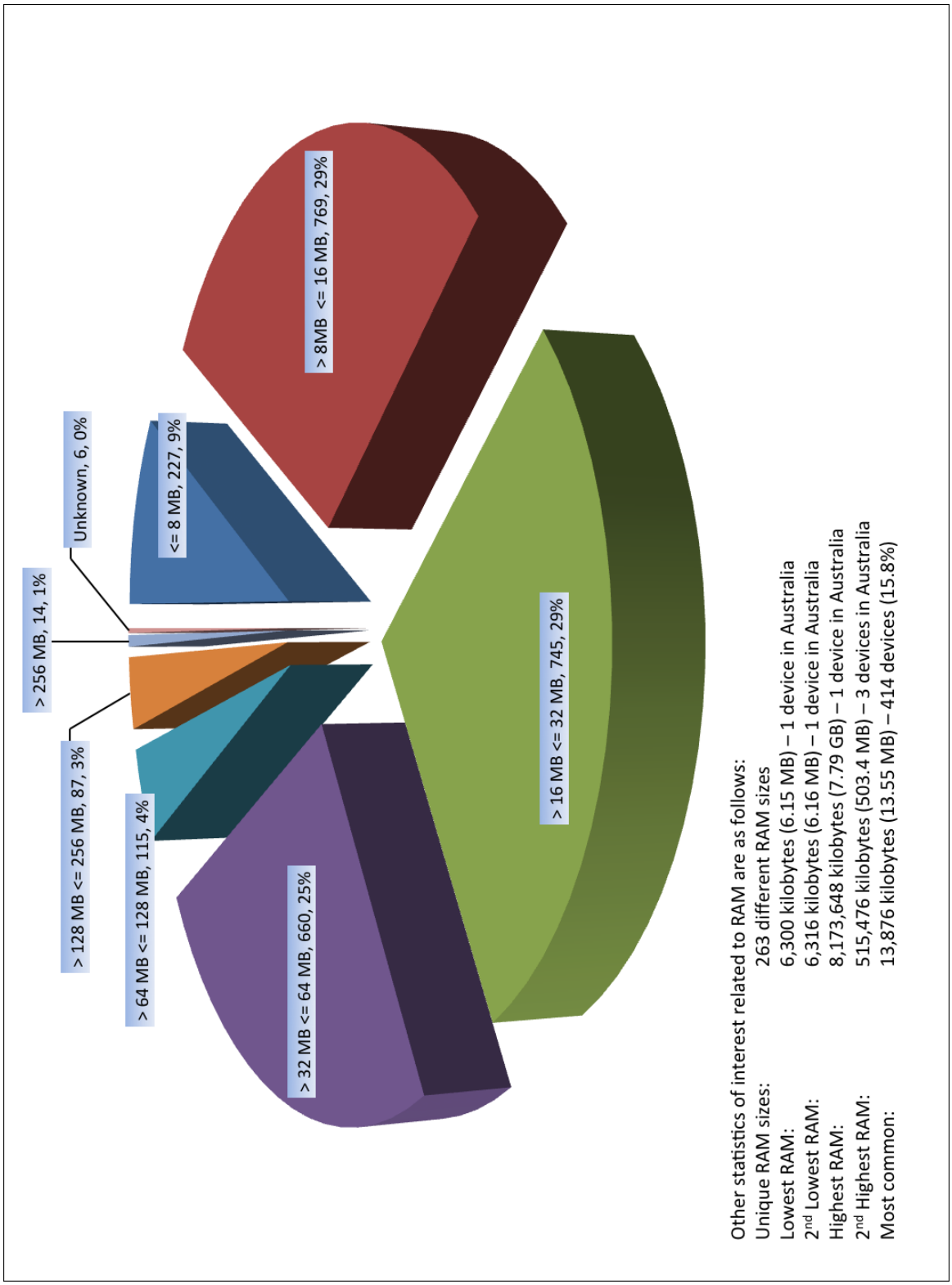


Figure 30: Oceania – RAM Distribution of Devices

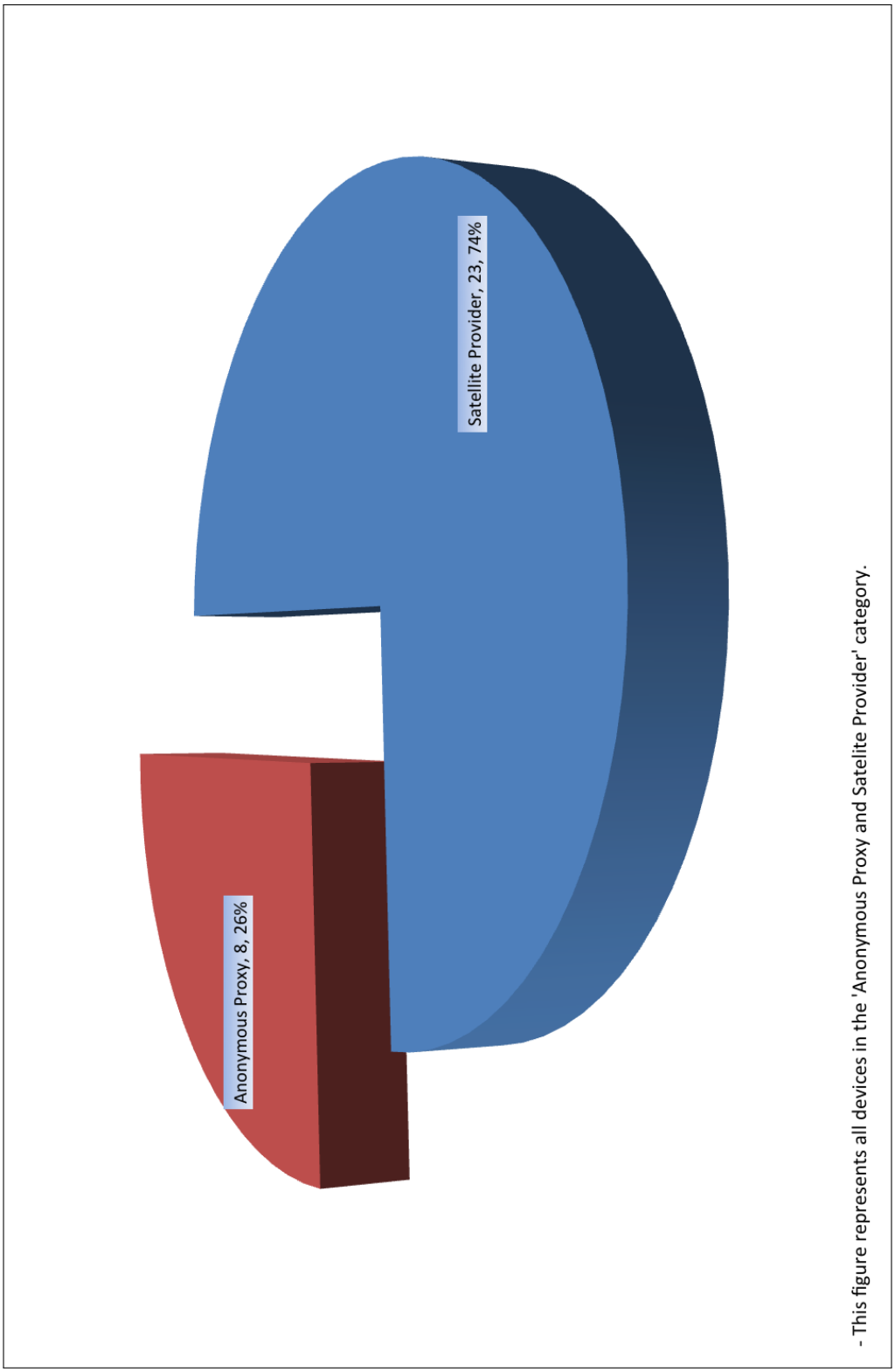


Figure 31: Anonymous Proxy and Satellite Provider– Device Distribution by Countries

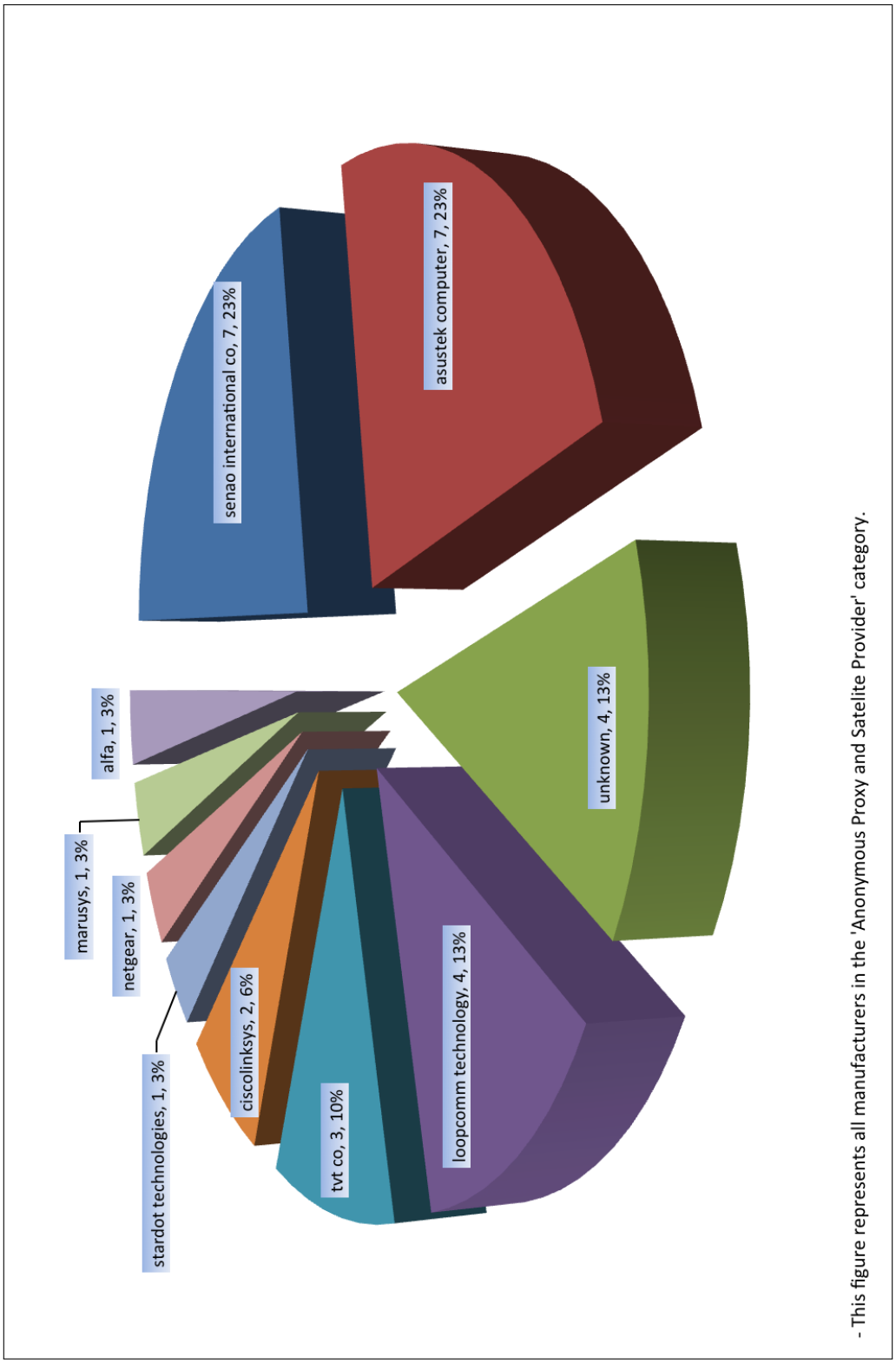


Figure 32: Anonymous Proxy and Satellite Provider – Device Distribution by Manufacturer

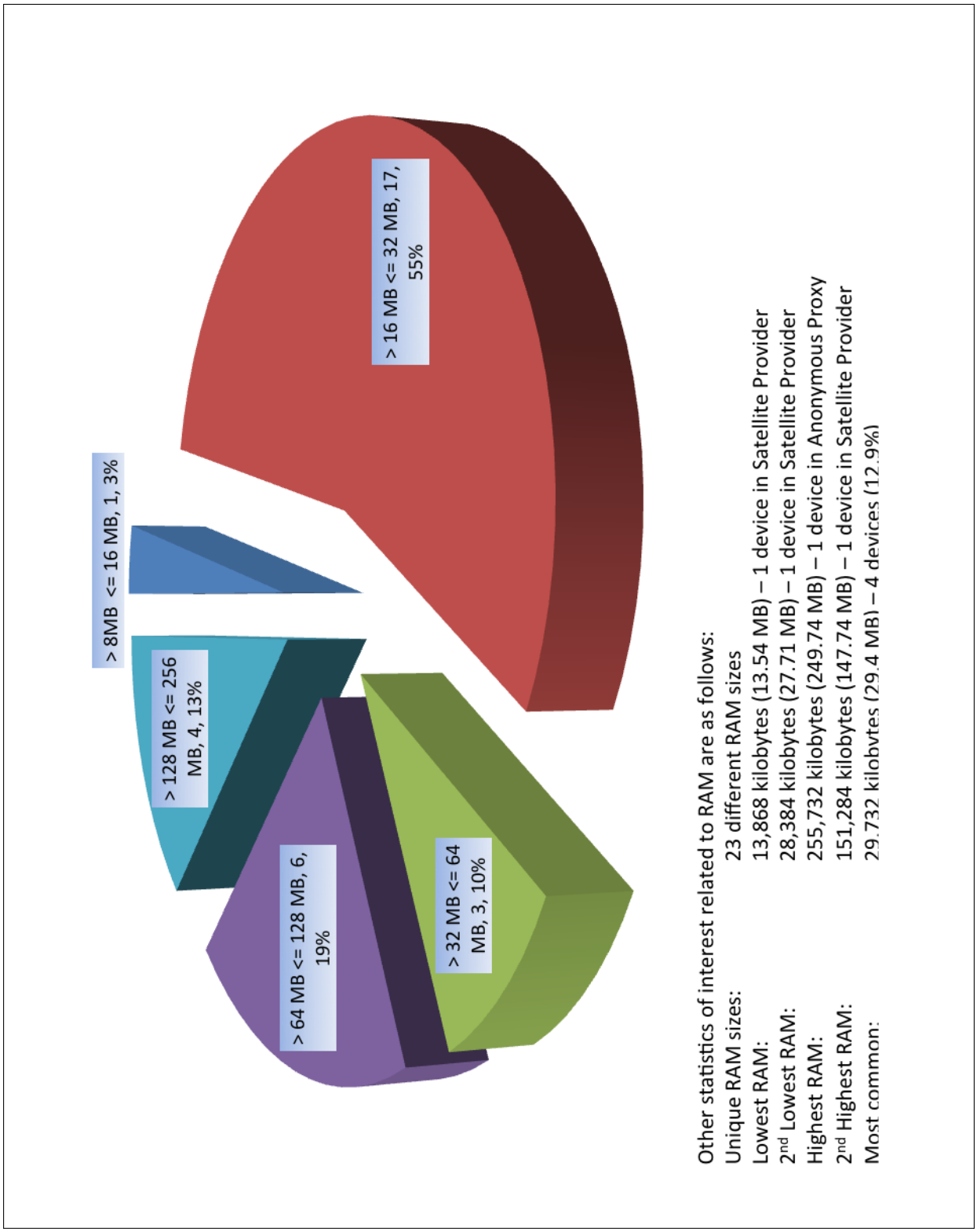


Figure 33: Anonymous Proxy and Satellite Provider – RAM Distribution of Devices

B List by Countries

A table detailing the statistics for every country is compiled on the next page. The table is ordered alphabetically by the 'Country Name'. A description of each of the fields is below:

- 'Infection Rank' column indicates the rank of the country (out of 197). A rank of 1 indicates the worst infection rate compared to allocated IPs. Two countries with the same infection ratio would have the same rank. This only happens once. Niger and Cape Verde both have a rank of 149. As a result the next rank to be assigned was 151, skipping 150 due to the duplicates of rank 149.
  - NOTE: Be cautious when using this column. Please read the '*Countries & IP Ranges*' section to understand how the calculations may be inaccurate for countries with a small number of IP allocations.
- 'Continent' column indicates the continent to which the country was considered associated for this paper. As mentioned at the beginning of Appendix A, this was deduced using MaxMind's 'ISO 3166 Country Codes with Associated Continent'.
- 'Infected Devices' column is derived from the Carna Botnet data.
- 'Officially Allocated IPs' column is derived from the data gathered from the Regional Internet Registry as discussed in '*Countries & IP Ranges*'.
- 'Officially Allocated C Classes (deduced)' column is derived by diving 'Officially Allocated IPs' column by 256 to derive the number of C classes.
- 'No. of Infected Devices per C Class' column is calculated by dividing the value of 'Infected Devices' column by the value in the 'Officially Allocated C Classes (deduced)' column. This field indicates the average number of infected devices in any given C class of the country.
- '1 device per how many C classes?' column is calculated by dividing 1 by 'Number of Infected Devices per C Class'. This field indicates the average number of C classes required to search in order find one vulnerable/infected device.
- '1 device per how many IPs?' column is calculated by multiplying '1 device per how many C classes?' by 256. This field indicates the average number of IPs needed to be scanned in order find one vulnerable/infected device.
- 'Seconds to find a vulnerable device' column is calculated by dividing '1 device per how many IPs' by 10. This field indicates how many seconds on average it would take to find one vulnerable/infected device if 10 devices per second were probed within the allocated IPs of the country.

The three countries below do not have any official IP allocation by one of the Regional Internet Registries. Therefore they are not part of the list starting on the next page. The other 197 countries are listed in the table on the next page.

- Anonymous Proxy: 8 Infected Devices
- Mayotte: 1 Infected Devices
- Satellite Provider: 23 Infected Devices

Rank	Country Name	Continent	Infected Devices	Officially Allocated IPs	Officially Allocated C Classes (deduced)	No of Infected Devices per C Class	1 device per how many C classes?	1 device per how many IPs?	Seconds to find a vulnerable device
86	Åland Islands	Europe	4	16,384	64	0.0625	16	4,096.00	409.6
72	Albania	Europe	105	319,232	1,247.00	0.0842	11.88	3,040.30	304.03
153	Algeria	Africa	130	2,580,992	10,082.00	0.0129	77.55	19,853.78	1,985.38
25	American Samoa	Oceania	5	4,096	16	0.3125	3.2	819.2	81.92
8	Andorra	Europe	158	33,792	132	1.197	0.84	213.87	21.39
129	Angola	Africa	27	299,264	1,169.00	0.0231	43.3	11,083.85	1,108.39
47	Anguilla	N America	2	4,096	16	0.125	8	2,048.00	204.8
190	Antigua and Barbuda	N America	1	59,392	232	0.0043	232	59,392.01	5,939.20
49	Argentina	S America	7,880	16,185,088	63,223.00	0.1246	8.02	2,053.95	205.39
20	Armenia	Asia	1,089	582,432	2,275.10	0.4787	2.09	534.83	53.48
47	Aruba	N America	19	38,912	152	0.125	8	2,048.00	204.8
175	Australia	Oceania	1,614	47,774,720	186,620.00	0.0086	115.63	29,600.20	2,960.02
173	Austria	Europe	421	11,676,768	45,612.40	0.0092	108.34	27,735.79	2,773.58
10	Azerbaijan	Asia	2,234	683,008	2,668.00	0.8373	1.19	305.73	30.57
46	Bahamas	N America	60	121,856	476	0.1261	7.93	2,030.93	203.09
34	Bahrain	Asia	383	471,040	1,840.00	0.2082	4.8	1,229.87	122.99
126	Bangladesh	Asia	90	935,936	3,656.00	0.0246	40.62	10,399.29	1,039.93
121	Barbados	N America	16	146,176	571	0.028	35.69	9,136.00	913.6
39	Belarus	Europe	1,087	1,787,904	6,984.00	0.1556	6.43	1,644.81	164.48
186	Belgium	Europe	294	11,568,320	45,188.80	0.0065	153.7	39,348.03	3,934.80
100	Belize	N America	18	101,888	398	0.0452	22.11	5,660.44	566.04
187	Benin	Africa	1	39,936	156	0.0064	156	39,936.00	3,993.60
164	Bermuda	N America	4	92,672	362	0.011	90.5	23,168.00	2,316.80
135	Bhutan	Asia	2	24,576	96	0.0208	48	12,288.00	1,228.80
27	Bolivia	S America	690	611,072	2,387.00	0.2891	3.46	885.61	88.56
43	Bosnia and Herzegovina	Europe	416	761,600	2,975.00	0.1398	7.15	1,830.77	183.08
41	Brazil	S America	30,452	54,855,168	214,278.00	0.1421	7.04	1,801.37	180.14
61	Brunei Darussalam	Asia	78	194,048	758	0.1029	9.72	2,487.79	248.78
29	Bulgaria	Europe	3,885	4,328,704	16,909.00	0.2298	4.35	1,114.21	111.42
111	Burkina Faso	Africa	8	53,248	208	0.0385	26	6,656.00	665.6
23	Cambodia	Asia	308	231,680	905	0.3403	2.94	752.21	75.22
85	Cameroon	Africa	35	138,496	541	0.0647	15.46	3,957.03	395.7
188	Canada	N America	1,907	79,730,432	311,447.00	0.0061	163.32	41,809.35	4,180.94
149	Cape Verde	Africa	1	17,408	68	0.0147	68	17,408.00	1,740.80

122	Cayman Islands	N America	4	37,888	148	0.027	37	9,472.00	947.2
62	Chile	S America	2,963	7,886,592	30,807.00	0.0962	10.4	2,661.69	266.17
18	China	Asia	720,141	329,997,824	1,289,054.00	0.5587	1.79	458.24	45.82
38	Colombia	S America	6,454	10,233,088	39,973.00	0.1615	6.19	1,585.54	158.55
132	Congo, the Democratic Republic of the	Africa	2	23,296	91	0.022	45.5	11,648.00	1,164.80
114	Cook Islands	Oceania	1	8,192	32	0.0313	32	8,192.00	819.2
52	Costa Rica	N America	1,082	2,286,080	8,930.00	0.1212	8.25	2,112.83	211.28
133	Cote D'Ivoire	Africa	14	170,496	666	0.021	47.57	12,178.29	1,217.83
137	Croatia	Europe	167	2,122,304	8,290.30	0.0201	49.64	12,708.41	1,270.84
110	Cuba	N America	18	117,760	460	0.0391	25.56	6,542.22	654.22
1	Curaçao	S America	490	1,024	4	122.5	0.01	2.09	0.21
159	Cyprus	Asia	47	987,712	3,858.30	0.0122	82.09	21,015.15	2,101.51
113	Czech Republic	Europe	1,097	8,983,424	35,091.50	0.0313	31.99	8,189.08	818.91
172	Denmark	Europe	458	12,519,216	48,903.20	0.0094	106.78	27,334.53	2,733.45
163	Djibouti	Africa	2	45,056	176	0.0114	88	22,528.00	2,252.80
35	Dominica	N America	4	5,120	20	0.2	5	1,280.00	128
65	Dominican Republic	N America	305	858,880	3,355.00	0.0909	11	2,816.00	281.6
91	Ecuador	S America	393	1,990,656	7,776.00	0.0505	19.79	5,065.28	506.53
68	Egypt	Africa	3,115	9,131,264	35,669.00	0.0873	11.45	2,931.38	293.14
116	El Salvador	N America	65	547,072	2,137.00	0.0304	32.88	8,416.49	841.65
106	Equatorial Guinea	Africa	2	12,288	48	0.0417	24	6,144.00	614.4
176	Estonia	Europe	42	1,261,368	4,927.20	0.0085	117.31	30,032.57	3,003.26
197	Europe - Generic	Europe	4	6,110,472	23,869.00	0.0002	5,967.26	1,527,619.48	152,761.95
123	Faroe Islands	Europe	4	39,936	156	0.0256	39	9,984.00	998.4
95	Fiji	Oceania	25	135,424	529	0.0473	21.16	5,416.96	541.7
178	Finland	Europe	425	13,682,304	53,446.50	0.008	125.76	32,193.66	3,219.37
185	France	Europe	2,436	95,696,144	373,813.10	0.0065	153.45	39,284.13	3,928.41
7	French Guiana	S America	11	2,048	8	1.375	0.73	186.18	18.62
157	French Polynesia	Oceania	2	41,472	162	0.0123	81	20,736.00	2,073.60
141	Gabon	Africa	13	178,688	698	0.0186	53.69	13,745.23	1,374.52
12	Georgia	Asia	3,343	1,157,376	4,521.00	0.7394	1.35	346.21	34.62
182	Germany	Europe	3,176	119,603,816	467,202.40	0.0068	147.1	37,658.63	3,765.86
154	Ghana	Africa	18	359,680	1,405.00	0.0128	78.06	19,982.22	1,998.22
143	Gibraltar	Europe	5	77,056	301	0.0166	60.2	15,411.20	1,541.12
120	Greece	Europe	672	6,009,600	23,475.00	0.0286	34.93	8,942.86	894.29
118	Grenada	N America	1	8,448	33	0.0303	33	8,448.00	844.8
5	Guadeloupe	N America	32	4,352	17	1.8824	0.53	136	13.6
9	Guam	Oceania	758	213,504	834	0.9089	1.1	281.67	28.17

26	Guatemala	N America	620	542,976	2,121.00	0.2923	3.42	875.77	87.58
22	Guernsey	Europe	3	2,048	8	0.375	2.67	682.67	68.27
37	Guyana	S America	28	41,984	164	0.1707	5.86	1,499.43	149.94
112	Haiti	N America	16	124,672	487	0.0329	30.44	7,792.00	779.2
24	Honduras	N America	454	344,320	1,345.00	0.3375	2.96	758.41	75.84
4	Hong Kong	Asia	91,453	11,822,848	46,183.00	1.9802	0.5	129.28	12.93
108	Hungary	Europe	936	5,897,472	23,037.00	0.0406	24.61	6,300.72	630.07
162	Iceland	Europe	38	822,784	3,214.00	0.0118	84.58	21,652.21	2,165.22
21	India	Asia	58,766	34,811,904	135,984.00	0.4322	2.31	592.38	59.24
105	Indonesia	Asia	2,841	17,419,776	68,046.00	0.0418	23.95	6,131.56	613.16
51	Iran, Islamic Republic of	Asia	4,587	9,566,208	37,368.00	0.1228	8.15	2,085.50	208.55
14	Iraq	Asia	1,507	568,832	2,222.00	0.6782	1.47	377.46	37.75
165	Ireland	Europe	267	6,208,016	24,250.10	0.011	90.82	23,251.00	2,325.10
59	Isle of Man	Europe	4	9,728	38	0.1053	9.5	2,432.00	243.2
28	Israel	Asia	8,475	7,528,768	29,409.30	0.2882	3.47	888.35	88.84
140	Italy	Europe	3,896	53,098,400	207,415.60	0.0188	53.24	13,628.95	1,362.90
30	Jamaica	N America	181	203,776	796	0.2274	4.4	1,125.83	112.58
196	Japan	Asia	430	201,967,616	788,936.00	0.0005	1,834.74	469,692.88	46,969.29
130	Jersey	Europe	5	56,320	220	0.0227	44	11,264.00	1,126.40
64	Jordan	Asia	239	662,912	2,589.50	0.0923	10.83	2,773.69	277.37
54	Kazakhstan	Asia	1,246	2,719,488	10,623.00	0.1173	8.53	2,182.57	218.26
33	Kenya	Africa	1,465	1,787,648	6,983.00	0.2098	4.77	1,220.24	122.02
11	Kiribati	Oceania	3	1,024	4	0.75	1.33	341.33	34.13
70	Korea, Republic of	Asia	38,200	112,256,512	438,502.00	0.0871	11.48	2,938.65	293.87
60	Kuwait	Asia	794	1,935,872	7,562.00	0.105	9.52	2,438.13	243.81
125	Kyrgyzstan	Asia	26	267,008	1,043.00	0.0249	40.12	10,269.54	1,026.95
69	Lao People's Dem. Rep.	Asia	19	55,808	218	0.0872	11.47	2,937.26	293.73
92	Latvia	Europe	329	1,693,888	6,616.80	0.0497	20.11	5,148.60	514.86
127	Lebanon	Asia	45	487,168	1,903.00	0.0236	42.29	10,825.96	1,082.60
142	Lesotho	Africa	3	44,800	175	0.0171	58.33	14,933.33	1,493.33
136	Libyan Arab Jamahiriya	Africa	24	302,080	1,180.00	0.0203	49.17	12,586.67	1,258.67
148	Liechtenstein	Europe	5	82,720	323.1	0.0155	64.63	16,544.00	1,654.40
109	Lithuania	Europe	355	2,307,584	9,014.00	0.0394	25.39	6,500.24	650.02
168	Luxembourg	Europe	50	1,326,080	5,180.00	0.0097	103.6	26,521.60	2,652.16
40	Macao	Asia	187	324,864	1,269.00	0.1474	6.79	1,737.24	173.72
83	Macedonia, the Former Yugoslav Republic of	Europe	171	665,088	2,598.00	0.0658	15.19	3,889.40	388.94
146	Madagascar	Africa	7	111,360	435	0.0161	62.14	15,908.57	1,590.86
193	Malawi	Africa	2	146,688	573	0.0035	286.5	73,344.01	7,334.40

19	Malaysia	Asia	13,781	6,338,560	24,760.00	0.5566	1.8	459.95	45.99
45	Maldives	Asia	29	54,784	214	0.1355	7.38	1,889.10	188.91
170	Mali	Africa	2	53,248	208	0.0096	104	26,624.00	2,662.40
94	Malta	Europe	105	562,432	2,197.00	0.0478	20.92	5,356.50	535.65
16	Martinique	N America	23	10,240	40	0.575	1.74	445.22	44.52
179	Mauritania	Africa	1	33,792	132	0.0076	132	33,792.00	3,379.20
44	Mauritius	Africa	261	491,008	1,918.00	0.1361	7.35	1,881.26	188.13
96	Mexico	N America	4,763	26,499,840	103,515.00	0.046	21.73	5,563.69	556.37
88	Moldova, Republic of	Europe	200	886,784	3,464.00	0.0577	17.32	4,433.92	443.39
78	Mongolia	Asia	58	205,824	804	0.0721	13.86	3,548.69	354.87
56	Montenegro	Europe	95	214,784	839	0.1132	8.83	2,260.88	226.09
87	Morocco	Africa	918	3,785,728	14,788.00	0.0621	16.11	4,123.89	412.39
177	Mozambique	Africa	13	415,232	1,622.00	0.008	124.77	31,940.93	3,194.09
119	Myanmar	Asia	3	25,600	100	0.03	33.33	8,533.33	853.33
194	Namibia	Africa	2	264,704	1,034.00	0.0019	517	132,352.07	13,235.21
90	Nepal	Asia	94	473,856	1,851.00	0.0508	19.69	5,041.02	504.1
189	Netherlands	Europe	1,036	45,324,288	177,048.00	0.0059	170.9	43,749.32	4,374.93
167	New Caledonia	Oceania	6	150,528	588	0.0102	98	25,088.00	2,508.80
180	New Zealand	Oceania	201	6,916,864	27,019.00	0.0074	134.42	34,412.26	3,441.23
101	Nicaragua	N America	65	368,128	1,438.00	0.0452	22.12	5,663.51	566.35
149	Niger	Africa	2	34,816	136	0.0147	68	17,408.00	1,740.80
134	Nigeria	Africa	106	1,297,920	5,070.00	0.0209	47.83	12,244.53	1,224.45
139	Northern Mariana Islands	Oceania	1	13,312	52	0.0192	52	13,312.00	1,331.20
169	Norway	Europe	577	15,352,880	59,972.20	0.0096	103.94	26,608.11	2,660.81
145	Oman	Asia	58	899,072	3,512.00	0.0165	60.55	15,501.24	1,550.12
71	Pakistan	Asia	1,762	5,189,376	20,271.00	0.0869	11.5	2,945.16	294.52
13	Palestinian Territory	Asia	1,514	559,616	2,186.00	0.6926	1.44	369.63	36.96
57	Panama	N America	764	1,751,552	6,842.00	0.1117	8.96	2,292.61	229.26
171	Papua New Guinea	Oceania	2	54,272	212	0.0094	106	27,136.00	2,713.60
93	Paraguay	S America	126	662,784	2,589.00	0.0487	20.55	5,260.19	526.02
50	Peru	S America	1,265	2,628,608	10,268.00	0.1232	8.12	2,077.95	207.8
15	Philippines	Asia	14,224	5,382,912	21,027.00	0.6765	1.48	378.44	37.84
66	Poland	Europe	7,180	20,358,248	79,524.40	0.0903	11.08	2,835.41	283.54
102	Portugal	Europe	1,046	5,932,064	23,172.10	0.0451	22.15	5,671.19	567.12
76	Puerto Rico	N America	296	1,001,984	3,914.00	0.0756	13.22	3,385.08	338.51
147	Qatar	Asia	49	810,240	3,165.00	0.0155	64.59	16,535.51	1,653.55
58	Reunion	Africa	14	32,768	128	0.1094	9.14	2,340.57	234.06
74	Romania	Europe	4,365	14,326,784	55,964.00	0.078	12.82	3,282.20	328.22
53	Russian Federation	Europe	21,357	45,493,792	177,710.10	0.1202	8.32	2,130.16	213.02

192	Rwanda	Africa	3	213,248	833	0.0036	277.67	71,082.68	7,108.27
158	Saint Kitts and Nevis	N America	3	62,464	244	0.0123	81.33	20,821.33	2,082.13
2	Saint Lucia	N America	14	256	1	14	0.07	18.29	1.83
103	Saint Vincent & Grenadines	N America	3	17,408	68	0.0441	22.67	5,802.67	580.27
82	San Marino	Europe	7	26,880	105	0.0667	15	3,840.00	384
166	Saudi Arabia	Asia	267	6,328,576	24,721.00	0.0108	92.59	23,702.53	2,370.25
89	Senegal	Africa	45	223,616	873.5	0.0515	19.41	4,969.24	496.92
67	Serbia	Europe	801	2,296,320	8,970.00	0.0893	11.2	2,866.82	286.68
161	Seychelles	Africa	12	257,792	1,007.00	0.0119	83.92	21,482.67	2,148.27
104	Singapore	Asia	1,039	6,071,552	23,717.00	0.0438	22.83	5,843.65	584.36
115	Slovakia	Europe	306	2,561,792	10,007.00	0.0306	32.7	8,371.87	837.19
138	Slovenia	Europe	194	2,558,848	9,995.50	0.0194	51.52	13,189.94	1,318.99
131	Solomon Islands	Oceania	1	11,520	45	0.0222	45	11,520.00	1,152.00
98	Somalia	Africa	2	11,264	44	0.0455	22	5,632.00	563.2
155	South Africa	Africa	1,203	24,282,880	94,855.00	0.0127	78.85	20,185.27	2,018.53
97	Spain	Europe	5,141	28,660,608	111,955.50	0.0459	21.78	5,574.91	557.49
17	Sri Lanka	Asia	1,191	535,296	2,091.00	0.5696	1.76	449.45	44.95
195	Sudan	Africa	1	412,928	1,613.00	0.0006	1,613.00	412,928.53	41,292.85
152	Suriname	S America	4	77,824	304	0.0132	76	19,456.00	1,945.60
181	Swaziland	Africa	1	36,608	143	0.007	143	36,608.01	3,660.80
156	Sweden	Europe	1,460	29,674,536	115,916.20	0.0126	79.39	20,325.03	2,032.50
184	Switzerland	Europe	562	21,640,248	84,532.20	0.0066	150.41	38,505.78	3,850.58
36	Taiwan	Asia	24,352	35,393,280	138,255.00	0.1761	5.68	1,453.40	145.34
160	Tajikistan	Asia	3	63,744	249	0.012	83	21,248.00	2,124.80
151	Tanzania, United Republic of	Africa	24	444,160	1,735.00	0.0138	72.29	18,506.67	1,850.67
32	Thailand	Asia	7,282	8,560,384	33,439.00	0.2178	4.59	1,175.55	117.56
75	Togo	Africa	4	13,312	52	0.0769	13	3,328.00	332.8
106	Tonga	Oceania	1	6,144	24	0.0417	24	6,144.00	614.4
79	Trinidad and Tobago	N America	140	502,784	1,964.00	0.0713	14.03	3,591.31	359.13
117	Tunisia	Africa	324	2,729,216	10,661.00	0.0304	32.9	8,423.51	842.35
6	Turkey	Europe	87,815	16,219,648	63,358.00	1.386	0.72	184.7	18.47
77	Turks and Caicos Islands	N America	3	10,240	40	0.075	13.33	3,413.33	341.33
174	Uganda	Africa	8	224,640	877.5	0.0091	109.69	28,080.00	2,808.00
31	Ukraine	Europe	10,874	12,550,464	49,025.30	0.2218	4.51	1,154.17	115.42
144	United Arab Emirates	Asia	207	3,205,248	12,520.50	0.0165	60.49	15,484.29	1,548.43
183	United Kingdom	Europe	3,284	123,968,272	484,251.10	0.0068	147.46	37,749.17	3,774.92
191	United States	N America	24,243	1,561,403,52(	6,099,232.50	0.004	251.59	64,406.37	6,440.64
3	Uruguay	S America	13,173	1,184,512	4,627.00	2.847	0.35	89.92	8.99
63	Uzbekistan	Asia	84	228,096	891	0.0943	10.61	2,715.43	271.54

98	Vanuatu	Oceania	2	11,264	44	0.0455	22	5,632.00	563.2
80	Venezuela	S America	1,593	5,842,944	22,824.00	0.0698	14.33	3,667.89	366.79
81	Viet Nam	Asia	4,078	15,551,232	60,747.00	0.0671	14.9	3,813.45	381.34
84	Virgin Islands, British	N America	5	19,712	77	0.0649	15.4	3,942.40	394.24
128	Virgin Islands, U.s.	N America	8	88,064	344	0.0233	43	11,008.00	1,100.80
73	Wallis and Futuna	Oceania	1	3,072	12	0.0833	12	3,072.00	307.2
55	Yemen	Asia	29	64,512	252	0.1151	8.69	2,224.55	222.46
42	Zambia	Africa	98	179,200	700	0.14	7.14	1,828.57	182.86
124	Zimbabwe	Africa	9	91,136	356	0.0253	39.56	10,126.22	1,012.62

C List by Manufacturers

The table below lists manufacturers alphabetically with the number of devices found in the data and the percentage of the data taken up by the manufacturer. The 'Rank' field indicates the rank of the manufacturers compared to other manufacturers. A rank of 1 indicates the manufacturer with the most devices in the data. If two manufacturers had the same number of devices, they would have the same rank.

Rank	Manufacturer Name	No.	%
296	100fio networks technology llc	24	0.0019
1065	2m2b montadora de maquinas bahia brasil ltda	1	0.0001
836	2wcom systems gmbh	2	0.0002
1065	2wire inc	1	0.0001
1065	3 com corporation	1	0.0001
324	3com corporation	20	0.0016
396	3com europe ltd	12	0.0009
1065	3com ltd	1	0.0001
697	3j tech co ltd	3	0.0002
1065	3par data	1	0.0001
336	4nsys co ltd	19	0.0015
1065	6wind	1	0.0001
1065	a brand new world in sweden ab	1	0.0001
1065	Ã…mic ab	1	0.0001
559	a2i marketing center	5	0.0004
836	aaeon technology inc	2	0.0002
1065	abb ab cewecontrol	1	0.0001
618	abb industrial systems ab	4	0.0003
1065	abb oy	1	0.0001
1065	abbott diagnostics	1	0.0001
697	abit corporation	3	0.0002
75	abocom	556	0.0433
1065	abocom systems inc	1	0.0001
78	abovecable inc	503	0.0391
1065	ac&t system co ltd	1	0.0001
1065	acacia networks inc	1	0.0001
618	acard technology corp	4	0.0003
1065	accella technologies co ltd	1	0.0001
1065	accense technology inc	1	0.0001
249	accton technology corporation	41	0.0032
559	accton wireless broadbandawb corp	5	0.0004
396	accutime systems inc	12	0.0009
187	aceex corporation	79	0.0061
1065	acer technologies corp	1	0.0001
697	aclara rf systems inc	3	0.0002
1065	acogito co ltd	1	0.0001
1065	acromate inc	1	0.0001
618	acti corporation	4	0.0003
101	actiontec electronics inc	361	0.0281
1065	active tchnology corporation	1	0.0001
1065	activnet gmbh & co kg	1	0.0001
559	actuality systems inc	5	0.0004
1065	adam elektronik ltd Åžti	1	0.0001
697	adaptix inc	3	0.0002
697	aday technology inc	3	0.0002
618	adb broadband italia	4	0.0003
559	ademco	5	0.0004
86	aditya infotech ltd	456	0.0355
267	adlink technology inc	31	0.0024
411	admtek incorporated	11	0.0009
697	adoir digital technology	3	0.0002
1065	ads technologies inc	1	0.0001
1065	adtran inc	1	0.0001
1065	advance sterilization products	1	0.0001

Rank	Manufacturer Name	No.	%
697	advanced computer solutions inc	3	0.0002
697	advanced control systems doo	3	0.0002
383	advanced digital broadcast ltd	13	0.001
559	advanced digital broadcast sa	5	0.0004
1065	advanced electronic design inc	1	0.0001
1065	advanced motion controls	1	0.0001
1065	advanced technical solutions	1	0.0001
1065	advanced telecommunications modules ltd	1	0.0001
1065	advansus corp	1	0.0001
396	advantech co ltd	12	0.0009
836	advantech technology china co ltd	2	0.0002
1065	advidia	1	0.0001
1065	aegate ltd	1	0.0001
836	aep systems international ltd	2	0.0002
836	aerosat avionics	2	0.0002
559	aerotech inc	5	0.0004
1065	aewin technologies co ltd	1	0.0001
1065	afar communicationsinc	1	0.0001
1065	afe computers ltd	1	0.0001
836	afreey inc	2	0.0002
1065	aft atlas fahrzeugtechnik gmbh	1	0.0001
697	agere systems	3	0.0002
1065	agfeo gmbh & co kg	1	0.0001
442	agilemesh inc	9	0.0007
1065	agilis corporation	1	0.0001
1065	agp telecom co ltd	1	0.0001
618	ahead communication systems inc	4	0.0003
836	aichi electric co ltd	2	0.0002
1065	aiptek international inc	1	0.0001
1065	air2u inc	1	0.0001
1065	airak inc	1	0.0001
618	airlink wifi networking corp	4	0.0003
618	airocon inc	4	0.0003
1065	airrunner technologies inc	1	0.0001
1065	airspan	1	0.0001
7	airties wireless networks	43564	3.3897
1065	aitech systems ltd	1	0.0001
1065	aiware inc	1	0.0001
1065	ajin vision coltd	1	0.0001
1065	akamai technologies inc	1	0.0001
1065	alacron inc	1	0.0001
1065	albatron technology	1	0.0001
836	alcad sl	2	0.0002
1065	alcatel di	1	0.0001
1065	alcatel north america esd	1	0.0001
516	alcatellucent shanghai bell co ltd	6	0.0005
559	alcon telecommunications co ltd	5	0.0004
1065	alexon co ltd	1	0.0001
77	alfa inc	541	0.0421
188	algo communication products ltd	77	0.006
207	algosystem co ltd	60	0.0047
836	aligera equipamentos digitais ltda	2	0.0002
1065	alink ltd	1	0.0001
105	all earth comÃƒÂ©rcio de eletrÃƒÂ´nicos ltda	326	0.0254
1065	allegro networks inc	1	0.0001
836	allgon ab	2	0.0002
1065	allied telesis	1	0.0001
463	allnet gmbh	8	0.0006
1065	alltec gmbh	1	0.0001
1065	allumer co ltd	1	0.0001
373	alpha networkc inc	14	0.0011

Rank	Manufacturer Name	No.	%
9	alpha networks inc	33807	2.6305
147	alpine electronics inc	149	0.0116
697	alps co ltd	3	0.0002
285	altecon srl	26	0.002
1065	amano corporation	1	0.0001
1065	amb it holding	1	0.0001
1065	ame optimedia technology co ltd	1	0.0001
131	amedia networks inc	188	0.0146
1065	amercom	1	0.0001
1065	american microfuel device corp	1	0.0001
463	american technology labs inc	8	0.0006
27	american time and signal	4452	0.3464
442	amigo technology co ltd	9	0.0007
1065	amino communications ltd	1	0.0001
1065	amit inc	1	0.0001
1065	amperion inc	1	0.0001
1065	amroad technology inc	1	0.0001
1065	anacise testnology pte ltd	1	0.0001
1065	anagran inc	1	0.0001
1065	analog & digital systems	1	0.0001
1065	anam electronics co ltd	1	0.0001
1065	andrew corporation	1	0.0001
1065	andrew rf power amplifier group	1	0.0001
1065	anite telecoms	1	0.0001
38	anneal technology inc	2314	0.1801
314	ansel communications	21	0.0016
836	anthology solutions inc	2	0.0002
1065	anue systems inc	1	0.0001
1065	any use	1	0.0001
618	aoc international europe gmbh	4	0.0003
516	aopen inc	6	0.0005
559	apd communications ltd	5	0.0004
1065	apexx technology inc	1	0.0001
618	apple computer	4	0.0003
836	apple computer inc	2	0.0002
516	apple inc	6	0.0005
1065	applicom international	1	0.0001
1065	applicon inc	1	0.0001
285	applied creative technology inc	26	0.002
463	applied innovation inc	8	0.0006
1065	applied network technology	1	0.0001
516	appointech inc	6	0.0005
1065	apprion	1	0.0001
261	appro technology inc	35	0.0027
1065	apptech inc	1	0.0001
1065	aprotech coltd	1	0.0001
836	arada systems inc	2	0.0002
1065	arbitron inc	1	0.0001
1065	arbor technology corp	1	0.0001
22	arcadyan technology corporation	6043	0.4702
1065	arcelik as	1	0.0001
1065	archtek telecom corporation	1	0.0001
442	arcor ag&co	9	0.0007
426	arcsoft shanghai co ltd	10	0.0008
836	area netwoeks inc	2	0.0002
1065	ared technology co ltd	1	0.0001
836	arescom	2	0.0002
836	argon networks inc	2	0.0002
1065	ario data networks inc	1	0.0001
1065	arizona instrument corp	1	0.0001
1065	ark telecommunications inc	1	0.0001

Rank	Manufacturer Name	No.	%
836	arlotto comnet inc	2	0.0002
1065	arm	1	0.0001
1065	armorlink shanghai co ltd	1	0.0001
1065	arris group inc	1	0.0001
314	arris international	21	0.0016
1065	artila electronics co ltd	1	0.0001
836	artjoy international limited	2	0.0002
516	aruze corporation	6	0.0005
1065	ascalade communications limited	1	0.0001
559	asd electronics ltd	5	0.0004
60	asiamajor inc	1078	0.0839
132	asiarock incorporation	183	0.0142
618	asiarock technology limited	4	0.0003
618	asiatelco technologies co	4	0.0003
1065	asip technologies inc	1	0.0001
1065	asix electronics corp	1	0.0001
1065	askey computer	1	0.0001
516	askey computer corp	6	0.0005
1065	asound electronic	1	0.0001
1065	asp computer products inc	1	0.0001
97	asrock incorporation	392	0.0305
481	astak inc	7	0.0005
169	astera technologies corp	111	0.0086
1065	aston electronic designs ltd	1	0.0001
1065	astron	1	0.0001
1065	astronautics ca ltd	1	0.0001
11	asustek computer inc	31457	2.4476
1065	at&t fixed wireless services	1	0.0001
697	ataw co ltd	3	0.0002
220	atec subsystem inc	53	0.0041
516	athena tech inc	6	0.0005
1065	atheros communications	1	0.0001
1065	atheros communications inc	1	0.0001
1065	ati electronicsshenzhen co ltd	1	0.0001
516	atlanta dth inc	6	0.0005
1065	atmark techno inc	1	0.0001
216	atop technologies inc	56	0.0044
1065	atrica	1	0.0001
1065	atroad a trimble company	1	0.0001
1065	atsumi electric coltd	1	0.0001
836	audiocodes usa inc	2	0.0002
1065	auerswald gmbh & co kg	1	0.0001
559	aurora networks	5	0.0004
176	av tech corporation	97	0.0075
618	avalue technology inc	4	0.0003
697	avaya inc	3	0.0002
1065	avecs bergen gmbh	1	0.0001
180	avermedia information inc	94	0.0073
137	avinfo	179	0.0139
1065	avio digital inc	1	0.0001
836	avitech international corp	2	0.0002
361	avm gmbh	15	0.0012
1065	awarepoint corporation	1	0.0001
1065	axcen photonics corporation	1	0.0001
836	axion technologies inc	2	0.0002
1065	axis communications ab	1	0.0001
1065	axview technology shenzhen coltd	1	0.0001
697	axxcelera broadband wireless	3	0.0002
1065	axxessit asa	1	0.0001
314	ayecom technology co ltd	21	0.0016
697	az inc	3	0.0002

Rank	Manufacturer Name	No.	%
15	aztech electronics pte ltd	14201	1.105
426	azurewave	10	0.0008
697	azurewave technologies inc	3	0.0002
1065	babcock & wilcox power generation group inc	1	0.0001
836	baker hughes inc	2	0.0002
836	balluff gmbh	2	0.0002
481	bandrich inc	7	0.0005
1065	bang and olufsen medicom as	1	0.0001
90	banksys	421	0.0328
836	baoding galaxy electronic technology coltd	2	0.0002
1065	barconet nv	1	0.0001
697	barracuda networks inc	3	0.0002
51	baudtec corporation	1352	0.1052
836	bbh systems gmbh	2	0.0002
302	bbraun melsungen ag	23	0.0018
463	bcm computers co ltd	8	0.0006
1065	beacon medical products llc dba beaconmedaes	1	0.0001
697	behavior tech computer corp	3	0.0002
1065	beicom inc	1	0.0001
137	beijing autelan technology inc	179	0.0139
1065	beijing broad telecom ltd china	1	0.0001
234	beijing huahuan eletronics coltd	46	0.0036
155	beijing inhand networking technology coltd	132	0.0103
1065	beijing nuqx technology coltd	1	0.0001
324	beijing topsec network security technology co ltd	20	0.0016
1065	beijing wise technology & science development coltd	1	0.0001
463	beijing xinwei telecom technology co ltd	8	0.0006
1065	belden	1	0.0001
516	belkin corporation	6	0.0005
57	belkin international inc	1158	0.0901
1065	benchmark storage innovations	1	0.0001
1065	benign technologies co ltd	1	0.0001
1065	bep marine	1	0.0001
93	beta research	409	0.0318
1065	bettini srl	1	0.0001
1065	billion electric co ltd	1	0.0001
481	binatone telecommunication pvt ltd	7	0.0005
1065	biometric access company	1	0.0001
1065	biopac systems inc	1	0.0001
836	biospace co ltd	2	0.0002
697	biostar microtech intl corp	3	0.0002
836	bitsgen co ltd	2	0.0002
1065	bixolon coltd	1	0.0001
618	blaupunkt embedded systems gmbh	4	0.0003
26	blink electronic limited	4528	0.3523
1065	blonder tongue laboratories inc	1	0.0001
463	blossoms digital technology coltd	8	0.0006
1065	bluearc uk ltd	1	0.0001
1065	bluepacket communications co ltd	1	0.0001
1065	bluetooth sig inc	1	0.0001
1065	blwave electronics co ltd	1	0.0001
346	blx ic design corp ltd	18	0.0014
559	blynke inc	5	0.0004
1065	bna systems	1	0.0001
442	bocom securityasia pacific limited	9	0.0007
697	bodmann industries elektronik gmbh	3	0.0002
1065	bona technology inc	1	0.0001
1065	bosch security systems bv	1	0.0001
1065	bpl limited	1	0.0001
836	bplan gmbh	2	0.0002
559	br controls nederland bv	5	0.0004

Rank	Manufacturer Name	No.	%
1065	brainchild electronic co ltd	1	0.0001
1065	brandywine communications	1	0.0001
191	bravo tech inc	72	0.0056
1065	brecis communications corporation	1	0.0001
1065	british telecommunications plc	1	0.0001
1065	brivo systems llc	1	0.0001
516	broadata communications inc	6	0.0005
697	broadbus technologies	3	0.0002
373	broadcom corporation	14	0.0011
1065	broadcom technologies	1	0.0001
697	broadeasy technologies coltd	3	0.0002
1065	broadtel canada communications inc	1	0.0001
1065	brocade communications systems inc	1	0.0001
1065	brovis wireless networks	1	0.0001
516	browan communication inc	6	0.0005
1065	bskyb ltd	1	0.0001
1065	btlinks company limited	1	0.0001
143	buffalo inc	163	0.0127
836	building b inc	2	0.0002
836	buyang electronics industrial co ltd	2	0.0002
1065	c&s technology	1	0.0001
426	c2 microsystems inc	10	0.0008
836	c4line	2	0.0002
1065	cabletron zeittnet inc	1	0.0001
836	cadco systems	2	0.0002
697	cadmus computer systems	3	0.0002
1065	cadre technologies	1	0.0001
1065	caffeina applied research ltd	1	0.0001
481	cai networks inc	7	0.0005
836	callpod inc	2	0.0002
1065	cambridge consultants ltd	1	0.0001
1065	cambridge industriesgroup coltd	1	0.0001
147	cameo communications inc	149	0.0116
213	camille bauer	58	0.0045
1065	camtec electronics ltd	1	0.0001
697	camtel technology corp	3	0.0002
559	camtron industrial inc	5	0.0004
618	canko technologies inc	4	0.0003
1065	canopus co ltd	1	0.0001
1065	cantronic international limited	1	0.0001
1065	cao group	1	0.0001
516	cap co ltd	6	0.0005
1065	capinfo company limited	1	0.0001
516	cardware lab inc	6	0.0005
836	carriercomm inc	2	0.0002
1065	casacom solutions ag	1	0.0001
1065	cascade communications corp	1	0.0001
1065	castlenet technology inc	1	0.0001
1065	catapult communications	1	0.0001
697	category solutions inc	3	0.0002
361	cayee computer ltd	15	0.0012
324	cbc co ltd	20	0.0016
1065	cbel corporation	1	0.0001
697	cbl gmbh	3	0.0002
214	cc&c technologies inc	57	0.0044
697	ccc network systems group ltd	3	0.0002
1065	ccornet	1	0.0001
1065	ce digitalzhenjiangcoltd	1	0.0001
697	cec telecom coltd	3	0.0002
1065	celan technology inc	1	0.0001
1065	cellebrite mobile synchronization	1	0.0001

Rank	Manufacturer Name	No.	%
1065	cellpoint connect	1	0.0001
1065	cem corporation	1	0.0001
463	centillium communications	8	0.0006
1065	central music co	1	0.0001
1065	central system research co ltd	1	0.0001
618	century systems corp	4	0.0003
314	cesnet	21	0.0016
1065	cetacea networks corporation	1	0.0001
516	cetia	6	0.0005
1065	chamberlain access solutions	1	0.0001
1065	changshu switchgear mfg coltd former changshu switchgea	1	0.0001
697	cheerchip electronic technology shanghai co ltd	3	0.0002
1065	cheng hongjian	1	0.0001
1065	chengdu 30kaitian communication industry coltd	1	0.0001
836	chengdu linkon communications device co ltd	2	0.0002
559	chengdu maipu electric industrial co ltd	5	0.0004
1065	chengdu volans technology coltd	1	0.0001
697	chi mei communication systems inc	3	0.0002
234	chic technology china corp	46	0.0036
1065	china iwncomm co ltd	1	0.0001
1065	chip pc ltd	1	0.0001
618	chippro ltd	4	0.0003
697	chiron technology ltd	3	0.0002
836	chuangyi network equipment coltd	2	0.0002
559	chung nam electronic co ltd	5	0.0004
128	cimsys inc	199	0.0155
1065	cirkitech electronics co	1	0.0001
836	cis technology inc	2	0.0002
234	cisco	46	0.0036
426	cisco consumer products llc	10	0.0008
346	cisco spvtg	18	0.0014
123	cisco systems inc	225	0.0175
260	ciscolinksys	37	0.0029
76	ciscolinksys llc	543	0.0423
1065	citel	1	0.0001
1065	citel spa	1	0.0001
1065	citronix llc	1	0.0001
697	city theatrical	3	0.0002
257	clarion corporation of america	38	0.003
1065	clearwire	1	0.0001
1065	clevo co	1	0.0001
1065	clinicomp intl	1	0.0001
1065	clipcomm inc	1	0.0001
697	cm comandos lineares	3	0.0002
559	cmax wireless co ltd	5	0.0004
1065	cml emergency services	1	0.0001
1065	cmotech co ltd	1	0.0001
1065	cnb technology inc	1	0.0001
324	cncrit coltdhangzhou prchina	20	0.0016
222	cnet technology inc	51	0.004
1065	cnrs	1	0.0001
289	coastcom	25	0.0019
559	coaxial networks inc	5	0.0004
836	code corporation	2	0.0002
442	codex corporation	9	0.0007
1065	coffee equipment company	1	0.0001
463	colorado vnet	8	0.0006
1065	com&c co ltd	1	0.0001
373	comba telecom systems china ltd	14	0.0011
1065	commerceguard ab	1	0.0001
697	commerciant lp	3	0.0002

Rank	Manufacturer Name	No.	%
1065	commscope canada inc	1	0.0001
1065	commtact ltd	1	0.0001
1065	commtech inc	1	0.0001
1065	communication automation corp	1	0.0001
1065	communications & power industries satcom division	1	0.0001
1065	communique wireless corp	1	0.0001
1065	compact data ltd	1	0.0001
1065	compact devices inc	1	0.0001
1065	compacta international ltd	1	0.0001
1065	compal communications inc	1	0.0001
697	compal information kunshan co ltd	3	0.0002
1065	compellent technologies inc	1	0.0001
697	compro technology	3	0.0002
1065	compulab ltd	1	0.0001
463	compuprint spa	8	0.0006
516	computer hardware design sia	6	0.0005
1065	computex co ltd	1	0.0001
1065	comsat ag	1	0.0001
1065	comtech research inc	1	0.0001
109	comtrend	300	0.0233
836	comtron inc	2	0.0002
249	conceptronic	41	0.0032
1065	conexant systems inc	1	0.0001
1065	congatec ag	1	0.0001
618	conitec datensysteme gmbh	4	0.0003
1065	consentry networks	1	0.0001
245	contal ok ltd	42	0.0033
836	continental automotive systems inc	2	0.0002
836	continuum technology corp	2	0.0002
1065	control express finland oy	1	0.0001
1065	control products inc	1	0.0001
836	control resources corporation	2	0.0002
1065	control solutions inc	1	0.0001
836	control4	2	0.0002
1065	controlnet inc	1	0.0001
1065	coolksky co ltd	1	0.0001
1065	coordiwise technology corp	1	0.0001
1065	core communications co ltd	1	0.0001
160	corebell systems inc	127	0.0099
1065	corona corporation	1	0.0001
1065	corventis inc	1	0.0001
180	cosco electronics co ltd	94	0.0073
280	coteau vert co ltd	28	0.0022
481	cotron corporation	7	0.0005
1065	covia inc	1	0.0001
463	cpu technology inc	8	0.0006
1065	cradle technologies	1	0.0001
697	cray communications as	3	0.0002
1065	cray communications ltd	1	0.0001
559	crest audio	5	0.0004
1065	crestron electronics inc	1	0.0001
156	cresyn	130	0.0101
1065	crete systems inc	1	0.0001
1065	crewave co ltd	1	0.0001
559	crypto sa	5	0.0004
836	cryptosoft	2	0.0002
697	csst	3	0.0002
1065	ctc union technologies co ltd	1	0.0001
1065	ctera networks ltd	1	0.0001
324	ctsclima temperatur systeme gmbh	20	0.0016
1065	cumminsallison corp	1	0.0001

Rank	Manufacturer Name	No.	%
481	current technologies llc	7	0.0005
1065	cwlinux limited	1	0.0001
836	cxp digital bv	2	0.0002
481	cybertan technology inc	7	0.0005
1065	cypress semiconductor	1	0.0001
697	d e shaw research llc	3	0.0002
1065	dacoll limited	1	0.0001
226	daeshininformation technology co ltd	50	0.0039
1065	daewoo telecom ltd	1	0.0001
481	dags	7	0.0005
373	dags inc	14	0.0011
1065	dai nippon printing co ltd	1	0.0001
442	dain telecom co ltd	9	0.0007
481	dallas semiconductor inc	7	0.0005
1065	daniel instruments ltd	1	0.0001
559	daniels electronics ltd dbo codan rado communications	5	0.0004
1065	dÃrr dental ag	1	0.0001
66	dasan co ltd	860	0.0669
302	data center systems	23	0.0018
1065	data electronics aust pty ltd	1	0.0001
1065	data labs inc	1	0.0001
1065	data ltd	1	0.0001
1065	data recall ltd	1	0.0001
1065	data voice technologies gmbh	1	0.0001
836	dataindustrier diab ab	2	0.0002
836	datalogic adc inc	2	0.0002
1065	datapoint corporation	1	0.0001
836	dataschalt e+a gmbh	2	0.0002
1065	datasensor spa	1	0.0001
1065	datasound laboratories ltd	1	0.0001
1065	datel electronics	1	0.0001
1065	datnet informatikai kft	1	0.0001
198	davicom semiconductor inc	67	0.0052
836	davolink co inc	2	0.0002
351	day one digital media limited	17	0.0013
1065	daysequerra corporation	1	0.0001
697	dbtel incorporated	3	0.0002
836	dea security	2	0.0002
1065	deck srl	1	0.0001
697	defidev	3	0.0002
836	dell computer corp	2	0.0002
373	dell esg pcba test	14	0.0011
314	dell inc	21	0.0016
1065	delta computer systems inc	1	0.0001
697	delta networks inc	3	0.0002
559	deltenna ltd	5	0.0004
1065	desay a&v science and technology coltd	1	0.0001
1065	desay electronicshuizhoucoltd	1	0.0001
1065	design design technology ltd	1	0.0001
1065	deskstation technology inc	1	0.0001
336	deutschmann automation gmbh & co kg	19	0.0015
314	dexter communications inc	21	0.0016
289	dgstation co ltd	25	0.0019
1065	dibalsa	1	0.0001
481	digiboard inc	7	0.0005
70	digicom spa	641	0.0499
62	digicube technology co ltd	1034	0.0805
1065	digital china shanghai networks ltd	1	0.0001
197	digital data communications asia coltd	70	0.0054
481	digital electronics corp	7	0.0005
618	digital forecast	4	0.0003

Rank	Manufacturer Name	No.	%
276	digital generation inc	29	0.0023
1065	digital microwave corporation	1	0.0001
618	digital multimedia technology co ltd	4	0.0003
836	digital stream technology inc	2	0.0002
481	digital telemedia coltd	7	0.0005
463	digital video networksshanghai co ltd	8	0.0006
25	digitalks inc	4644	0.3613
1065	digiview srl	1	0.0001
1065	dilithium networks	1	0.0001
618	dionex	4	0.0003
1065	display solution ag	1	0.0001
1065	dixtal biomedica ind com ltda	1	0.0001
1065	dizipia inc	1	0.0001
1065	dlink	1	0.0001
12	dlink corporation	20139	1.567
40	dlink international	2180	0.1696
106	dlink international pte limited	322	0.0251
516	dlink systems inc	6	0.0005
836	dmax technology coltd	2	0.0002
324	dmd computers srl	20	0.0016
1065	dmp electronics inc	1	0.0001
1065	dongseo system	1	0.0001
151	draytek corp	143	0.0111
23	dreammultimediatv gmbh	5951	0.463
1065	drew technologies inc	1	0.0001
195	dtvro	71	0.0055
200	duzon cnt co ltd	63	0.0049
618	dynacolor inc	4	0.0003
1065	dynamix promotions limited	1	0.0001
1065	dynamode group	1	0.0001
1065	dynatech computer systems	1	0.0001
836	e2s electronic engineering solutions sl	2	0.0002
1065	eaget innovation and technology co ltd	1	0.0001
1065	eal apeldoorn bv	1	0.0001
559	eastern asia technology limited	5	0.0004
1065	eastern electronic co ltd	1	0.0001
383	easy3call technology limited	13	0.001
1065	echostar technologies corp	1	0.0001
1065	eci telecom ngts ltd	1	0.0001
1065	eci telecom ltd	1	0.0001
836	ecm systems ltd	2	0.0002
697	edata communication inc	3	0.0002
697	edgepoint networks inc	3	0.0002
32	edimax technology co ltd	3181	0.2475
1065	edmi	1	0.0001
836	edup international hk co ltd	2	0.0002
121	efm networks	242	0.0188
697	efs sas	3	0.0002
1065	eg technology	1	0.0001
836	eidsvoll electronics as	2	0.0002
1065	eigen development	1	0.0001
1065	eis international inc	1	0.0001
559	elber srl	5	0.0004
1065	eldat communication ltd	1	0.0001
1065	electronic design and manufacturing company	1	0.0001
43	electronic educational devices inc	2050	0.1595
836	electrosonic ltd	2	0.0002
1065	elentec	1	0.0001
697	elitegroup computer system	3	0.0002
463	elitegroup computer system co	8	0.0006
516	elitegroup computer system co ltd	6	0.0005

Rank	Manufacturer Name	No.	%
697	elitegroup computer systems co ltd	3	0.0002
559	ellion digital inc	5	0.0004
836	elma trenew electronic gmbh	2	0.0002
1065	eltech inc	1	0.0001
618	em technics co ltd	4	0.0003
1065	emc corporation kashya	1	0.0001
836	emco flow systems	2	0.0002
1065	emerson network power avocent division	1	0.0001
1065	emk elektronik gmbh & co kg	1	0.0001
836	empower technologiescanada inc	2	0.0002
1065	ems satcom	1	0.0001
697	emtronix	3	0.0002
836	encanto networks inc	2	0.0002
1065	engel axil sl	1	0.0001
1065	enhanced messaging systems inc	1	0.0001
1065	enjoyweb inc	1	0.0001
1065	ennovate networks inc	1	0.0001
836	enseo inc	2	0.0002
618	enterasys	4	0.0003
1065	entra technology co	1	0.0001
1065	entropic communications inc	1	0.0001
228	epigram inc	49	0.0038
336	epin technologies inc	19	0.0015
1065	epl technology ltd	1	0.0001
1065	epox computer co ltd	1	0.0001
411	eq3 entwicklung gmbh	11	0.0009
1065	equiptrans	1	0.0001
1065	esang technologies co ltd	1	0.0001
618	escape communications inc	4	0.0003
836	esd electronic system design gmbh	2	0.0002
697	esmartcom inc	3	0.0002
1065	essensium nv	1	0.0001
261	essential communications	35	0.0027
836	estic corporation	2	0.0002
1065	esystems incgarland div	1	0.0001
63	ethernet direct corporation	996	0.0775
1065	etrali sa	1	0.0001
1065	etrend electronics inc	1	0.0001
836	etrovision technology	2	0.0002
1065	euchner gmbh+co kg	1	0.0001
314	eunicorn	21	0.0016
1065	eurem gmbh	1	0.0001
836	eurotech srl	2	0.0002
373	everfocus electronics corp	14	0.0011
1065	evertz microsystems ltd	1	0.0001
426	exadigm inc	10	0.0008
1065	excel inc	1	0.0001
697	excel master ltd	3	0.0002
1065	executone information systems inc	1	0.0001
1065	exeo systems	1	0.0001
1065	exio communications inc	1	0.0001
1065	expertise engineering	1	0.0001
836	eyefi inc	2	0.0002
559	f5 networks inc	5	0.0004
836	facom uk ltd melksham	2	0.0002
1065	falco data products	1	0.0001
1065	fast corporation	1	0.0001
1065	feig electronic gmbh	1	0.0001
1065	festo ag & co kg	1	0.0001
618	fi win inc	4	0.0003
618	fiberhome telecommunication techcoltd	4	0.0003

Rank	Manufacturer Name	No.	%
46	fiberhome telecommunication technologies coltd	1872	0.1457
396	fibronics ltd	12	0.0009
289	fida international s pte ltd	25	0.0019
516	finedigital inc	6	0.0005
697	finest security systems co ltd	3	0.0002
1065	first communication inc	1	0.0001
697	fitre spa	3	0.0002
1065	flexdsl telecommunications ag	1	0.0001
697	flextronics	3	0.0002
697	flytech technology co ltd	3	0.0002
1065	fms force measuring systems ag	1	0.0001
336	fon technology sl	19	0.0015
1065	force10 networks inc	1	0.0001
1065	ford aerospace & comm corp	1	0.0001
114	forks inc	276	0.0215
1065	formosa21 inc	1	0.0001
411	forth corporation public company limited	11	0.0009
83	fortis inc	491	0.0382
618	foxconn	4	0.0003
697	franklin electric co inc	3	0.0002
296	fraunhofer fokus	24	0.0019
1065	free2move ab	1	0.0001
1065	freecom technologies gmbh	1	0.0001
836	freescale semiconductor	2	0.0002
1065	frontier silicon ltd	1	0.0001
336	fs forthsysteme gmbh	19	0.0015
35	fuho technology co ltd	2601	0.2024
1065	fujant inc	1	0.0001
100	fujian star terminal	362	0.0282
48	fujian starnet communication coltd	1717	0.1336
111	fujian sunnada communication coltd	293	0.0228
177	fujikura ltd	96	0.0075
836	fujitsu inetwork systems limited	2	0.0002
296	fujitsu limited	24	0.0019
426	fujitsu nexion inc	10	0.0008
697	fujitsu siemens computers	3	0.0002
411	fujitsu technology solutions	11	0.0009
1065	fukuda denshi co ltd	1	0.0001
1065	furuno electric co ltd	1	0.0001
1065	fusion in tech co ltd	1	0.0001
108	fusion x co ltd	312	0.0243
1065	fusiontech technologies inc	1	0.0001
245	future systems inc	42	0.0033
1065	g2 networks inc	1	0.0001
1065	galactic computing corp	1	0.0001
1065	galaxy telecom technologies ltd	1	0.0001
214	galea network security	57	0.0044
1065	gateworks corp	1	0.0001
1065	gatsometer	1	0.0001
1065	gci science&technology coltd	1	0.0001
1065	gct semiconductor inc	1	0.0001
302	ge healthcare biosciences ab	23	0.0018
276	ge security	29	0.0023
1065	gefran spa	1	0.0001
1065	gemalto epayment	1	0.0001
136	gemtek technology co ltd	180	0.014
230	general dynamics	47	0.0037
836	general satellite research & development limited	2	0.0002
836	genesys logic inc	2	0.0002
1065	genetec inc	1	0.0001
1065	genexis bv	1	0.0001

Rank	Manufacturer Name	No.	%
1065	geospace technologies	1	0.0001
836	geovision inc	2	0.0002
463	ges singapore pte ltd	8	0.0006
1065	giga fast e ltd	1	0.0001
1065	gigabit optics corporation	1	0.0001
383	gigabyte	13	0.001
463	gigabyte technology co ltd	8	0.0006
168	gigabyte technology coltd	112	0.0087
1065	gilbarco inc	1	0.0001
24	gk computer	5081	0.3953
1065	globalsat international technology ltd	1	0.0001
1065	globaltop technology inc	1	0.0001
463	gloscom co ltd	8	0.0006
1065	gma communication manufactg	1	0.0001
1065	gn as gn netcom as	1	0.0001
836	gn netcom as	2	0.0002
210	goldstar information & comm	59	0.0046
836	good way ind co ltd	2	0.0002
314	goodman corporation	21	0.0016
697	goodrich sensor systems	3	0.0002
618	gpro computer	4	0.0003
836	grainmustards coltd	2	0.0002
1065	granch ltd	1	0.0001
697	grandeye ltd	3	0.0002
836	grandtec electronic corp	2	0.0002
1065	grass valley group	1	0.0001
103	green packet bhd	336	0.0261
836	greystone data system inc	2	0.0002
1065	grid systems	1	0.0001
1065	griffin technology	1	0.0001
1065	group sense limited	1	0.0001
1065	grupo digicon	1	0.0001
1065	gsi helmholtzzentrum für schwerionenforschung gmbh	1	0.0001
1065	gsteletech coltd	1	0.0001
836	guang zhou trisun electronics technology co ltd	2	0.0002
836	guangdong gosun telecommunications coltd	2	0.0002
411	guangdong leawin group co ltd	11	0.0009
1065	guangdong province electronic technology research institute	1	0.0001
270	guangzhou escene computer technology limited	30	0.0023
383	guangzhou horizontal information & network integration co ltd	13	0.001
1065	guangzhou jinpeng group coltd	1	0.0001
346	guangzhou new postcom equipment coltd	18	0.0014
42	guangzhou post & telecom equipment ltd	2065	0.1607
1065	guangzhou thinker technology co ltd	1	0.0001
516	gvc corporation	6	0.0005
152	h3c technologies co limited	138	0.0107
1065	haas automation inc	1	0.0001
1065	hakusanmfgcoltd	1	0.0001
19	hame technology co limited	7427	0.5779
697	hamilton hallmark	3	0.0002
191	hand held products inc	72	0.0056
1065	handlink technologies inc	1	0.0001
1065	hangzhou dptech technologies co ltd	1	0.0001
346	hangzhou h3c technologies co limited	18	0.0014
174	hangzhou h3c technologies co ltd	98	0.0076
836	hangzhou hollysys automation co ltd	2	0.0002
697	hangzhou zenointel technology co ltd	3	0.0002
206	hanilstm co ltd	61	0.0047
836	hansun technologies inc	2	0.0002
1065	hansung teliann inc	1	0.0001
697	hanwang technology coltd	3	0.0002

Rank	Manufacturer Name	No.	%
516	hanyang digitech co ltd	6	0.0005
195	harbour networks ltd co beijing	71	0.0055
1065	harmonic inc	1	0.0001
836	harris government communications	2	0.0002
296	hauppauge computer works inc	24	0.0019
1065	hazeltine corporation ms 117	1	0.0001
836	hbrain	2	0.0002
234	hess sbautomatenbau gmbh	46	0.0036
618	hewlett packard	4	0.0003
1065	hewlettpackard	1	0.0001
1065	hewlettpackard co	1	0.0001
147	hewlettpackard company	149	0.0116
411	hfr inc	11	0.0009
324	hid corporation	20	0.0016
307	hiflying electronics technology coltd	22	0.0017
697	highgain antennas llc	3	0.0002
1065	hioki ee corporation	1	0.0001
836	hip shing electronics ltd	2	0.0002
1065	hirakawa hewtech corp	1	0.0001
1065	hisense broadband multimedia technology coltd	1	0.0001
230	hisense mobile communications technoligy coltd	47	0.0037
411	hisharp	11	0.0009
1065	hit incorporated	1	0.0001
186	hitron systems inc	80	0.0062
697	hitron technology inc	3	0.0002
836	hivion co ltd	2	0.0002
230	hms industrial networks	47	0.0037
1065	hoatech technologies inc	1	0.0001
559	holl technology coltd	5	0.0004
697	homelogic llc	3	0.0002
1065	hon hai precision ind co ltd	1	0.0001
204	hon hai precision ind coltd	62	0.0048
559	hon hai precision indcoltd	5	0.0004
249	honeywell cmss	41	0.0032
162	honeywell co ltd korea	123	0.0096
559	hopling technologies bv	5	0.0004
1065	horiba ltd	1	0.0001
559	horoquartz	5	0.0004
836	hostnet corporation	2	0.0002
1065	hotlava systems inc	1	0.0001
1065	hs automatic aps	1	0.0001
119	hsing tech enterprise co ltd	253	0.0197
1065	hsing tech enterprise coltd	1	0.0001
836	htrc automation inc	2	0.0002
836	hu zhou nava networks&electronics ltd	2	0.0002
618	huawei symantec technologies coltd	4	0.0003
134	huawei technologies co ltd	181	0.0141
177	huawei technologies coltd	96	0.0075
836	huber + suhner ag	2	0.0002
1065	huges hitech inc	1	0.0001
618	hughes lan systems	4	0.0003
307	humax co ltd	22	0.0017
373	humax cotld	14	0.0011
836	humo laboratoryltd	2	0.0002
31	hunt electronic co ltd	3290	0.256
1065	hunter technology inc	1	0.0001
1065	hurob coltd	1	0.0001
481	hylab technology inc	7	0.0005
836	hypercom inc	2	0.0002
1065	hyundai networks inc	1	0.0001
1065	i controls inc	1	0.0001

Rank	Manufacturer Name	No.	%
1065	ibis tek llc	1	0.0001
336	ibm corp	19	0.0015
1065	ibsmm embedded electronics consulting	1	0.0001
1065	ibus	1	0.0001
240	icantek co ltd	44	0.0034
463	icatch inc	8	0.0006
1065	icefyre semiconductor	1	0.0001
559	icp internet communication payment ag	5	0.0004
1065	icpdas coltd	1	0.0001
836	idcs nv	2	0.0002
207	idealbt technology corporation	60	0.0047
396	idk corporation	12	0.0009
618	idy corporation	4	0.0003
1065	ieee i&m society tc9	1	0.0001
130	ieee registration authority please see iab public listing for more information	189	0.0147
1065	ifotec	1	0.0001
481	igt	7	0.0005
442	iinet labs pty ltd	9	0.0007
1065	ikanos communications	1	0.0001
1065	ilryung telesys inc	1	0.0001
697	imacs gmbh	3	0.0002
1065	imcagmbh	1	0.0001
516	imi norgren ltd	6	0.0005
1065	imi technology co ltd	1	0.0001
285	imk networks coltd	26	0.002
1065	imperial technology inc	1	0.0001
697	impinj inc	3	0.0002
1065	imt information management t	1	0.0001
1065	in motion technology inc	1	0.0001
1065	in2 groupe intertechnique	1	0.0001
1065	indac bv	1	0.0001
285	indigo active vision systems limited	26	0.002
1065	indigo security co ltd	1	0.0001
1065	industrial defender inc	1	0.0001
1065	industrie dial face spa	1	0.0001
1065	ines test and measurement gmbh & cokg	1	0.0001
463	inetcam inc	8	0.0006
697	inew digital company	3	0.0002
697	infinite electronics inc	3	0.0002
1065	infinova llc	1	0.0001
1065	infomark coltd	1	0.0001
1065	information presentation tech	1	0.0001
307	infra access korea co ltd	22	0.0017
307	ingersollrand	22	0.0017
1065	initio corporation	1	0.0001
1065	innerspace	1	0.0001
1065	innerwireless	1	0.0001
516	innodigital co ltd	6	0.0005
1065	innotz co ltd	1	0.0001
1065	innovance networks	1	0.0001
836	innovation sound technology co ltd	2	0.0002
1065	inpegvision co ltd	1	0.0001
1065	inpro comm	1	0.0001
1065	institut für prüftechnik	1	0.0001
1065	instrumentation technologies dd	1	0.0001
1065	intec automation inc	1	0.0001
1065	integrated design tools inc	1	0.0001
697	integrated system solution corp	3	0.0002
516	integrix inc	6	0.0005
267	intel corporate	31	0.0024
116	intel corporation	267	0.0208

Rank	Manufacturer Name	No.	%
145	intelbras	156	0.0121
618	intellambda systems inc	4	0.0003
1065	intelligent systems	1	0.0001
156	inteno broadband technology ab	130	0.0101
1065	interactive computing devices	1	0.0001
1065	interactive wear ag	1	0.0001
354	interenergy coltd	16	0.0012
481	internet information image inc	7	0.0005
836	internet initiative japan inc	2	0.0002
1065	intersil corp	1	0.0001
697	intersoft co	3	0.0002
1065	interspiro ab	1	0.0001
1065	intertain inc	1	0.0001
1065	intotech inc	1	0.0001
836	intraserver technology	2	0.0002
1065	intrinsyc software international inc	1	0.0001
516	intronics bv	6	0.0005
1065	inventec corporation	1	0.0001
1065	inventel	1	0.0001
836	inventel systemes	2	0.0002
1065	inventory conversion inc	1	0.0001
314	inxtron inc	21	0.0016
1065	io data device inc	1	0.0001
1065	ioi technology corporation	1	0.0001
1065	iolan holding	1	0.0001
270	ionix inc	30	0.0023
1065	ionsign oy	1	0.0001
516	ipac technology co ltd	6	0.0005
396	ipcserv technology corp	12	0.0009
697	ipitomy communications	3	0.0002
1065	ipoptical inc	1	0.0001
836	ips doo	2	0.0002
1065	ipulse systems	1	0.0001
1065	iquest nz ltd	1	0.0001
697	iritel ad	3	0.0002
270	irz automation technologies ltd	30	0.0023
481	isco international	7	0.0005
697	istor networks inc	3	0.0002
1065	it watchdogs inc	1	0.0001
618	itec co ltd	4	0.0003
1065	itfactory inc	1	0.0001
1065	itoh denki coltd	1	0.0001
1065	itx eglobaledge corporation	1	0.0001
217	itx security co ltd	55	0.0043
1065	iva corporation	1	0.0001
697	iveia llc	3	0.0002
1065	iwics inc	1	0.0001
1065	iwill corporation	1	0.0001
1065	jäger computergesteuerte meßtechnik gmbh	1	0.0001
1065	jama electronics co ltd	1	0.0001
836	japan cash machine co ltd	2	0.0002
697	japan radio company	3	0.0002
1065	japan total design communication co ltd	1	0.0001
1065	jascom co ltd	1	0.0001
1065	jasmine networks inc	1	0.0001
836	jazzmutant	2	0.0002
1065	jds uniphase inc	1	0.0001
481	jensen scandinavia as	7	0.0005
1065	jeol system technology co ltd	1	0.0001
1065	jeongmin electronics coltd	1	0.0001
836	jetway information co ltd	2	0.0002

Rank	Manufacturer Name	No.	%
1065	jiangsu yitong hightech coltd	1	0.0001
152	jjplus corporation	138	0.0107
836	jorjin technologies inc	2	0.0002
516	jow tong technology co ltd	6	0.0005
1065	js co neurocom	1	0.0001
1065	jsc goodwineuropa	1	0.0001
1065	jtag technologies bv	1	0.0001
1065	jthree international holding co ltd	1	0.0001
70	jump industrielle computertechnik gmbh	641	0.0499
559	jumpnode systems llc	5	0.0004
396	just in mobile information technologies shanghai co ltd	12	0.0009
1065	kaga electronics co ltd	1	0.0001
442	kaon media co ltd	9	0.0007
836	kapsys	2	0.0002
1065	karam	1	0.0001
836	karl storz imaging	2	0.0002
836	karo electronics gmbh	2	0.0002
94	kasda digital technology coltd	408	0.0317
361	kathreinwerke kg	15	0.0012
1065	katsujima co ltd	1	0.0001
1065	kbt mobile	1	0.0001
836	kendin semiconductor inc	2	0.0002
95	kentek information systemsinc	404	0.0314
302	key technology inc	23	0.0018
1065	keycorp ltd	1	0.0001
1065	keyprocessor bv	1	0.0001
1065	keytronix	1	0.0001
1065	kikusui electronics corp	1	0.0001
1065	kilchherr elektronik ag	1	0.0001
618	kingjon digital technology coltd	4	0.0003
1065	kingston technology corp	1	0.0001
836	kingtek cctv alliance co ltd	2	0.0002
1065	kingtronics industrial co ltd	1	0.0001
73	kingwave technology co ltd	589	0.0458
1065	kiryung electronics	1	0.0001
836	kisan electronics co	2	0.0002
1065	kla instruments corporation	1	0.0001
1065	kleinhenz elektronik gmbh	1	0.0001
836	kmw inc	2	0.0002
1065	knick elektronische messgeraete gmbh & co kg	1	0.0001
1065	kodeos communications	1	0.0001
1065	koenig & bauer ag	1	0.0001
516	koko fitness inc	6	0.0005
1065	kokusai electric co ltd	1	0.0001
39	kongtop industrialshen zhencoltd	2298	0.1788
20	konka group co ltd	6703	0.5216
1065	kontron america inc	1	0.0001
618	korenix technologies co ltd	4	0.0003
442	kozumi usa corp	9	0.0007
270	kprotech co ltd	30	0.0023
189	kreatel communications ab	74	0.0058
697	kt&c co ltd	3	0.0002
411	ktf technologies inc	11	0.0009
618	kti	4	0.0003
1065	kubotek corporation	1	0.0001
182	kvbanalect	88	0.0068
1065	kwikbyte llc	1	0.0001
697	kws computersysteme gmbh	3	0.0002
836	kye systems corp	2	0.0002
1065	kylink communications corp	1	0.0001
1065	kyocera corporation	1	0.0001

Rank	Manufacturer Name	No.	%
1065	kyohritsu electronic industry co ltd	1	0.0001
1065	kyosan electric mfg co ltd	1	0.0001
1065	kyowa electric & machinery corp	1	0.0001
1065	kyung il	1	0.0001
1065	l3 communications display systems	1	0.0001
1065	laguna hills inc	1	0.0001
1065	laketune technologies co ltd	1	0.0001
1065	lanbit computer inc	1	0.0001
836	lancelan technologies sl	2	0.0002
1065	lancom systems gmbh	1	0.0001
1065	landis+gyr ltd	1	0.0001
836	lanergy ltd	2	0.0002
1065	lanner electronics inc	1	0.0001
697	lanpro inc	3	0.0002
697	lanready technologies inc	3	0.0002
1065	lantiq deutschland gmbh	1	0.0001
1065	le information communication inc	1	0.0001
1065	le shi zhi xin electronic technology tianjin coltd	1	0.0001
442	leader electronics corp	9	0.0007
836	leadtek research inc	2	0.0002
264	leeds & northrup australia pty ltd	34	0.0026
1065	lego system as ie electronics division	1	0.0001
1065	legra systems inc	1	0.0001
1065	leica geosystems ag	1	0.0001
1065	leipold+cogmbh	1	0.0001
1065	lemcom systems inc	1	0.0001
1065	lesswire ag	1	0.0001
1065	letek communications inc	1	0.0001
836	lexbox	2	0.0002
559	lexmark international inc	5	0.0004
836	lg electronics	2	0.0002
37	lg electronics inc	2390	0.186
234	lg innotek	46	0.0036
191	lgericsson coltd	72	0.0056
1065	liba maschinenfabrik gmbh	1	0.0001
1065	liberty electronics	1	0.0001
836	librestream technologies inc	2	0.0002
697	licera ab	3	0.0002
1065	licomm co ltd	1	0.0001
1065	liebherr elektronik gmbh	1	0.0001
1065	lifesize communications inc	1	0.0001
618	lift complex ds jsc	4	0.0003
1065	lilee systems ltd	1	0.0001
396	linktop technology co ltd	12	0.0009
1065	linkup systems corporation	1	0.0001
697	lintech gmbh	3	0.0002
1065	liquid computing	1	0.0001
1065	lismore instruments limited	1	0.0001
1065	liteon communications inc	1	0.0001
1065	liteon it corporation	1	0.0001
1065	liteon tech corp	1	0.0001
1065	liteon technology corporation	1	0.0001
559	liveu ltd	5	0.0004
1065	liyuh technology ltd	1	0.0001
426	ln srithai comm ltd	10	0.0008
516	lockheed martin tactical systems	6	0.0005
697	locusnetworks corporation	3	0.0002
1065	logibag	1	0.0001
1065	logic controls inc	1	0.0001
1065	logic innovations inc	1	0.0001
618	logic product development	4	0.0003

Rank	Manufacturer Name	No.	%
836	logitec corporation	2	0.0002
383	lohuis networks	13	0.001
442	long ben dongguan electronic technology coltd	9	0.0007
1065	long well electronics corp	1	0.0001
618	longcheer technology singapore pte ltd	4	0.0003
324	longicorn inc	20	0.0016
67	loopcomm technology inc	766	0.0596
1065	lopa information technology	1	0.0001
1065	loytec electronics gmbh	1	0.0001
1065	lpl development sa de cv	1	0.0001
836	ls cable and system ltd	2	0.0002
836	lsb broadcast technologies gmbh	2	0.0002
1065	lucent technologies	1	0.0001
1065	lucidata ltd	1	0.0001
836	lumasense technologies	2	0.0002
1065	lumenera corporation	1	0.0001
1065	lung hwa electronics co ltd	1	0.0001
1065	lxe	1	0.0001
836	lxi consortium	2	0.0002
1065	lyan inc	1	0.0001
836	m2c electronic technology ltd	2	0.0002
1065	m2mnet co ltd	1	0.0001
1065	mac system co ltd	1	0.0001
1065	madge ltd	1	0.0001
1065	magicram inc	1	0.0001
1065	magnetic autocontrol gmbh	1	0.0001
1065	magtek inc	1	0.0001
1065	mahi networks	1	0.0001
1065	makino milling machine co ltd	1	0.0001
116	maksat technologies p ltd	267	0.0208
1065	makus inc	1	0.0001
1065	malibu networks	1	0.0001
383	manufacturing resources international	13	0.001
697	maple networks co ltd	3	0.0002
1065	maquet critical care ab	1	0.0001
618	marantz brand company	4	0.0003
481	march networks spa	7	0.0005
442	marconi communications	9	0.0007
49	marusys	1714	0.1334
618	marvell semiconductor inc	4	0.0003
1065	mas elektronik ag	1	0.0001
1065	maschoff design engineering	1	0.0001
1065	massana inc	1	0.0001
1065	masterclock inc	1	0.0001
618	matisse networks inc	4	0.0003
1065	matrix design group llc	1	0.0001
836	matrix telecom pvt ltd	2	0.0002
1065	matsushita comm ind co ltd	1	0.0001
1065	matsushita electric industrial coltd	1	0.0001
1065	matsushita electronic instruments corp	1	0.0001
1065	matuschek messtechnik gmbh	1	0.0001
266	mavix ltd	32	0.0025
836	maxid pty ltd	2	0.0002
1065	maxton technology corporation	1	0.0001
156	maxtor corporation	130	0.0101
1065	maxvision llc	1	0.0001
1065	maxxan systems inc	1	0.0001
697	mccain inc	3	0.0002
516	measurement computing corp	6	0.0005
255	measy electronics ltd	40	0.0031
1065	medeng systems inc	1	0.0001

Rank	Manufacturer Name	No.	%
1065	mediacell inc	1	0.0001
1065	mediafire corporation	1	0.0001
1065	mediaq	1	0.0001
1065	mediatek corp	1	0.0001
836	mediatek inc	2	0.0002
1065	medion ag	1	0.0001
1065	megaton house ltd	1	0.0001
1065	megatron computer industries pty ltd	1	0.0001
82	melita international corp	494	0.0384
836	mercury corporation	2	0.0002
78	merit lilin ent	503	0.0391
1065	merlin csi	1	0.0001
1065	merry electrics co ltd	1	0.0001
426	messoa technologies inc	10	0.0008
1065	metalink ltd	1	0.0001
1065	metel sro	1	0.0001
559	metrohm ag	5	0.0004
1065	michels & kleberhoff computer	1	0.0001
1065	mico electricshenzhen limited	1	0.0001
1065	micro control systems inc	1	0.0001
1065	micro motion inc	1	0.0001
1065	micro research institute inc	1	0.0001
1065	micro technology co ltd	1	0.0001
296	microchip technology inc	24	0.0019
1065	microcom	1	0.0001
146	microelectronics technology inc	152	0.0118
383	micronet communications inc	13	0.001
1065	micropross	1	0.0001
1065	microscan systems inc	1	0.0001
1065	microstar international	1	0.0001
697	microstar international co ltd	3	0.0002
411	microstar intl co ltd	11	0.0009
559	microstar intl coltd	5	0.0004
618	microtechno corporation	4	0.0003
1065	microweb co ltd	1	0.0001
1065	midstream technologies inc	1	0.0001
267	millinet co ltd	31	0.0024
1065	mirae its coltd	1	0.0001
1065	miralink corporation	1	0.0001
1065	miranda technologies inc	1	0.0001
1065	missouri freenet	1	0.0001
1065	misys financial systems ltd	1	0.0001
481	mitac international corp	7	0.0005
1065	miteq inc	1	0.0001
481	mitrastar technology	7	0.0005
361	mitsumi electric co ltd	15	0.0012
697	mitutoyo corporation	3	0.0002
1065	mix srl	1	0.0001
1065	mobiis co ltd	1	0.0001
1065	mobile computing promotion consortium	1	0.0001
1065	mobillian corporation	1	0.0001
1065	modacom	1	0.0001
411	modoosis inc	11	0.0009
1065	molecular devices corporation	1	0.0001
618	monitoring technologies limited	4	0.0003
836	moram co ltd	2	0.0002
1065	morega systems	1	0.0001
1065	moreton bay	1	0.0001
383	mosdan internation coltd	13	0.001
836	motion control systems inc	2	0.0002
618	motorola	4	0.0003

Rank	Manufacturer Name	No.	%
1065	motorola broadband communications sector	1	0.0001
1065	motorola inc	1	0.0001
184	motorola mobility inc	82	0.0064
1065	movacolor bv	1	0.0001
128	moxa technologies corp ltd	199	0.0155
1065	mrotek limited	1	0.0001
1065	mrt micro inc	1	0.0001
1065	mrv communication networks ltd	1	0.0001
354	msi	16	0.0012
396	msi technology gmbh	12	0.0009
618	mtx inc	4	0.0003
1065	multicom industries limited	1	0.0001
1065	multilink inc	1	0.0001
836	multimedia & communication technology	2	0.0002
516	multitech systems inc	6	0.0005
618	murata manufacturing co ltd	4	0.0003
1065	musashi engineering co ltd	1	0.0001
210	muxcom inc	59	0.0046
361	mykotronx	15	0.0012
1065	mythology tech express inc	1	0.0001
1065	naeil community	1	0.0001
1065	nakayo telecommunications inc	1	0.0001
85	nanwang multimedia incltd	467	0.0363
164	nat gmbh	118	0.0092
1065	national datacomm corporation	1	0.0001
1065	national enhance technology inc	1	0.0001
1065	national radio astronomy observatory	1	0.0001
1065	naztec inc	1	0.0001
1065	ndr coltd	1	0.0001
1065	nec magnus communicationsltd	1	0.0001
1065	nec tokin corporation	1	0.0001
1065	nec unified solutions nederland bv	1	0.0001
307	neighbor world co ltd	22	0.0017
836	neo networks inc	2	0.0002
559	neo telecom	5	0.0004
836	neon technology inc	2	0.0002
1065	neonode ab	1	0.0001
516	neotune information technology corporationltd	6	0.0005
836	net & sys co ltd	2	0.0002
1065	netapp inc	1	0.0001
96	netcomm limited	396	0.0308
836	netcons sro	2	0.0002
1065	netcore systems inc	1	0.0001
1065	neteffect incorporated	1	0.0001
59	netgear	1096	0.0853
163	netgear inc	119	0.0093
1065	netmodule ag	1	0.0001
249	netpower inc	41	0.0032
618	netronix inc	4	0.0003
1065	nets technology co ltd	1	0.0001
1065	netspan corporation	1	0.0001
1065	netspect technologies inc	1	0.0001
346	netstreams llc	18	0.0014
1065	netvision corporation	1	0.0001
836	network application technology	2	0.0002
836	network equipment technologies	2	0.0002
1065	network equipment technologies inc	1	0.0001
1065	network machines inc	1	0.0001
218	network services group	54	0.0042
302	network systems group ltd nsg	23	0.0018
1065	neural image co ltd	1	0.0001

Rank	Manufacturer Name	No.	%
1065	neuron company limited	1	0.0001
314	neuros technology international llc	21	0.0016
516	new voice international ag	6	0.0005
1065	newisysinc	1	0.0001
1065	newsoft technology corporation	1	0.0001
516	nexcom international co ltd	6	0.0005
1065	nexo communications inc	1	0.0001
836	nexql corporation	2	0.0002
1065	next generation systems inc	1	0.0001
559	next inc	5	0.0004
1065	next nets corporation	1	0.0001
1065	nexteye co ltd	1	0.0001
1065	nexus electronics	1	0.0001
516	nidec sankyo corporation	6	0.0005
1065	niko nv	1	0.0001
1065	ningbo andy optoelectronic co ltd	1	0.0001
107	nintendo co ltd	321	0.025
1065	nippon denso industry co ltd	1	0.0001
1065	nishimu electronics industries co ltd	1	0.0001
1065	nitgen co ltd	1	0.0001
618	nittan company limited	4	0.0003
1065	nl technology	1	0.0001
836	nmtel co ltd	2	0.0002
442	nokia danmark as	9	0.0007
1065	nolan systems	1	0.0001
354	norcontrol as	16	0.0012
836	nortel	2	0.0002
618	nortel networks	4	0.0003
36	novatechnology inc	2532	0.197
1065	novatium solutions p ltd	1	0.0001
411	novatron co ltd	11	0.0009
1065	novera optics korea inc	1	0.0001
88	novus security sp z oo	442	0.0344
1065	ntp elektronik as	1	0.0001
257	nuvico	38	0.003
1065	nuvo technologies llc	1	0.0001
296	nv philips industrial activities	24	0.0019
1065	nxp semiconductors	1	0.0001
1065	nxtphase t&d corp	1	0.0001
1065	o2micro inc	1	0.0001
1065	ob telecom electronic technology co ltd	1	0.0001
1065	obihai technology inc	1	0.0001
1065	obr centrum techniki morskiej sa	1	0.0001
1065	occam networks	1	0.0001
1065	ocean optics inc	1	0.0001
836	octel communications corp	2	0.0002
618	of networks co ltd	4	0.0003
1065	ohkura electric co ltd	1	0.0001
1065	ojelectronics as	1	0.0001
1065	okano electric coltd	1	0.0001
1065	olympus soft imaging solutions gmbh	1	0.0001
1065	omnex control systems	1	0.0001
307	omron tateisi electronics co	22	0.0017
1065	on software international limited	1	0.0001
1065	onda communication spa	1	0.0001
836	oneaccess sa	2	0.0002
836	oneline ag	2	0.0002
618	online corporation	4	0.0003
697	ooma inc	3	0.0002
45	opcom	1899	0.1478
618	open networks engineering ltd	4	0.0003

Rank	Manufacturer Name	No.	%
836	open stack inc	2	0.0002
383	open telecom	13	0.001
836	opicom	2	0.0002
1065	opnet technologies co ltd	1	0.0001
1065	optelian access networks	1	0.0001
1065	optex coltd	1	0.0001
354	opticom communications llc	16	0.0012
697	option international nv	3	0.0002
836	optosecurity inc	2	0.0002
99	opzoon technology coltd	370	0.0288
618	oracle corporation	4	0.0003
697	orient telecom co ltd	3	0.0002
1065	ortana ltd	1	0.0001
1065	oscilloquartz sa	1	0.0001
1065	oslink sp z oo	1	0.0001
1065	ost ouest standard telematiqu	1	0.0001
559	otrum asa	5	0.0004
697	otsuka electronics co ltd	3	0.0002
697	ouen coltd	3	0.0002
1065	oullim information technology inc	1	0.0001
1065	ovation systems ltd	1	0.0001
1065	overture networks	1	0.0001
697	ovislink sa	3	0.0002
697	p&e microcomputer systems inc	3	0.0002
411	pace plc	11	0.0009
1065	pacific satellite international ltd	1	0.0001
836	packard bell elec inc	2	0.0002
1065	packetfront network products ab	1	0.0001
559	padtec sa	5	0.0004
1065	page iberica sa	1	0.0001
1065	pairgain technologies inc	1	0.0001
1065	palm wireless inc	1	0.0001
618	palmmicro communications inc	4	0.0003
1065	panasonic europe ltd	1	0.0001
1065	panduit corp	1	0.0001
1065	pangolin	1	0.0001
836	pano logic	2	0.0002
55	paradigm technology inc	1220	0.0949
559	paradise datacom ltd	5	0.0004
1065	paralan corporation	1	0.0001
836	pathscale inc	2	0.0002
1065	pavo inc	1	0.0001
836	paytec ag	2	0.0002
559	pc engines gmbh	5	0.0004
1065	pc partner ltd	1	0.0001
559	pci corporation	5	0.0004
836	pcpos inc	2	0.0002
1065	pcs	1	0.0001
1065	peco ii inc	1	0.0001
1065	pedestal networks inc	1	0.0001
276	pegatron corporation	29	0.0023
1065	peiker acustic gmbh & co kg	1	0.0001
836	peplink ltd	2	0.0002
1065	perle systems limited	1	0.0001
836	petcomkorea co ltd	2	0.0002
1065	peterson electromusical products inc	1	0.0001
1065	petrotest instruments	1	0.0001
426	pharmasmart llc	10	0.0008
1065	pharos systems nz	1	0.0001
1065	phasecom ltd	1	0.0001
1065	phasys ltd	1	0.0001

Rank	Manufacturer Name	No.	%
836	philips lighting bv	2	0.0002
1065	philips patient monitoring	1	0.0001
481	phoenix contact gmbh & co	7	0.0005
1065	photuris inc	1	0.0001
1065	phybridge inc	1	0.0001
836	phyllis co ltd	2	0.0002
559	phywe systeme gmbh & co kg	5	0.0004
1065	picosecond pulse labs	1	0.0001
1065	picturetel corp	1	0.0001
697	pigeon point systems llc	3	0.0002
516	pinetron co ltd	6	0.0005
1065	ping communication	1	0.0001
697	pingood technology co ltd	3	0.0002
442	piolink inc	9	0.0007
1065	pioneer corporation	1	0.0001
697	pirelli tyre spa	3	0.0002
836	pitney bowes inc	2	0.0002
1065	pittasoft	1	0.0001
1065	pixelworks inc	1	0.0001
836	pixim	2	0.0002
442	pixord corporation	9	0.0007
1065	planet system coltd	1	0.0001
115	planet technology corporation	270	0.021
1065	planex communications	1	0.0001
1065	pleiades communications inc	1	0.0001
1065	plexus xiamen coltd	1	0.0001
463	plus corporation	8	0.0006
1065	plus technology co ltd	1	0.0001
442	pocketnet technology inc	9	0.0007
1065	pointred telecom private ltd	1	0.0001
697	polar electro oy	3	0.0002
697	polaris communications inc	3	0.0002
836	polestar corp	2	0.0002
697	portwell inc	3	0.0002
618	posiflex inc	4	0.0003
1065	power distribution inc	1	0.0001
361	powerlayer microsystems hongkong limited	15	0.0012
1065	powersoft srl	1	0.0001
1065	powertech coltd	1	0.0001
1065	ppt vision inc	1	0.0001
1065	precise automation inc	1	0.0001
1065	presstek inc	1	0.0001
324	prevas as	20	0.0016
516	primax electronics ltd	6	0.0005
183	prime electronics & satellitics inc	87	0.0068
1065	prime option inc	1	0.0001
836	prime systems inc	2	0.0002
1065	primenet	1	0.0001
1065	princeton networks inc	1	0.0001
1065	printer systems corp	1	0.0001
697	prism media products limited	3	0.0002
34	private	2955	0.2299
1065	procket networks	1	0.0001
836	projectek networking electronics corp	2	0.0002
142	projectiondesign as	164	0.0128
1065	proliphix inc	1	0.0001
836	prolog	2	0.0002
516	prolon control systems	6	0.0005
1065	prompttec product management gmbh	1	0.0001
618	pronet gmbh	4	0.0003
426	pronets technology corporation	10	0.0008

Rank	Manufacturer Name	No.	%
1065	prosoft technology inc	1	0.0001
697	protec fire detection plc	3	0.0002
239	protechna herbst gmbh & co kg	45	0.0035
1065	protelevision technologies as	1	0.0001
226	proware technologies co ltd	50	0.0039
1065	pt panggung electric citrabuana	1	0.0001
383	puritan bennett	13	0.001
836	puroptix	2	0.0002
1065	qbit gmbh	1	0.0001
442	qcom technology inc	9	0.0007
1065	qei inc	1	0.0001
1065	qisda corporation	1	0.0001
1065	qlogic corporation	1	0.0001
1065	qmatic sweden ab	1	0.0001
697	qno technology inc	3	0.0002
1065	qovia	1	0.0001
481	qtum	7	0.0005
516	quanta computer inc	6	0.0005
836	quanta microsystems inc	2	0.0002
836	quantum designs hk ltd	2	0.0002
56	quopin co ltd	1211	0.0942
289	qvidium technologies inc	25	0.0019
836	radiant communications corp	2	0.0002
836	radiopulse inc	2	0.0002
481	radisys corporation	7	0.0005
697	radlive	3	0.0002
836	radspin	2	0.0002
1065	radstone technology	1	0.0001
29	ralink technology corp	3641	0.2833
1065	rapid city communications	1	0.0001
1065	raster ops corporation	1	0.0001
836	rasvia systems inc	2	0.0002
697	rational	3	0.0002
373	ratoc system inc	14	0.0011
1065	raybit systems korea inc	1	0.0001
1065	raylan corporation	1	0.0001
1065	razorstream llc	1	0.0001
1065	rb generalekonomik	1	0.0001
1065	rdc semiconductor inc	1	0.0001
140	readynet	167	0.013
72	realtek semiconductor corp	639	0.0497
282	redcom labs inc	27	0.0021
1065	redux communications ltd	1	0.0001
559	relia technolgies	5	0.0004
1065	remopro technology inc	1	0.0001
218	repotec co ltd	54	0.0042
1065	research in motion	1	0.0001
1065	rf systems gmbh	1	0.0001
1065	rftech coltd	1	0.0001
134	ring access inc	181	0.0141
1065	rinnai korea	1	0.0001
1065	rion co ltd	1	0.0001
836	rise computer inc	2	0.0002
1065	rittmeyer ag	1	0.0001
1065	rivertec corporation	1	0.0001
697	rlw inc	3	0.0002
1065	robinson corporation	1	0.0001
426	rohati systems	10	0.0008
1065	roll systems inc	1	0.0001
697	rosewill inc	3	0.0002
1065	routerboardcom	1	0.0001

Rank	Manufacturer Name	No.	%
836	rpc energoautomatika ltd	2	0.0002
697	rpcg llc	3	0.0002
618	rse informations technologie gmbh	4	0.0003
1065	ruckus wireless	1	0.0001
836	ruggedcom	2	0.0002
836	runtop inc	2	0.0002
1065	rwt gmbh	1	0.0001
1065	ryco electronic systems limited	1	0.0001
1065	s& as ltd	1	0.0001
618	sagem communication	4	0.0003
697	sagemcom	3	0.0002
618	sagetv llc	4	0.0003
361	sakuma design office	15	0.0012
1065	salicru sa	1	0.0001
1065	salland engineering europe bv	1	0.0001
697	samsung electromechanics	3	0.0002
559	samsung electromechanics co ltd	5	0.0004
351	samsung electronics	17	0.0013
264	samsung electronics co ltd	34	0.0026
697	samsung electronics coltd	3	0.0002
836	samsung eletronics co ltd	2	0.0002
1065	samsung techwin coltd	1	0.0001
1065	sandlinks systems ltd	1	0.0001
396	sane system co ltd	12	0.0009
836	sanminasci	2	0.0002
144	santachi video technology shenzhen co ltd	157	0.0122
1065	sanyo electric co ltd	1	0.0001
559	sarotech co ltd	5	0.0004
1065	satcom media corporation	1	0.0001
1065	satel sp z oo	1	0.0001
1065	satelsa sistemas y aplicaciones de telecomunicaciones sa	1	0.0001
836	sato corporation	2	0.0002
1065	scan engineering telecom	1	0.0001
1065	scanvaegt international as	1	0.0001
1065	scemtec transponder technology gmbh	1	0.0001
200	schaffner deutschland gmbh	63	0.0049
1065	schenck process gmbh	1	0.0001
1065	schneider electric	1	0.0001
1065	schneider electric ultra terminal	1	0.0001
836	scientific atlanta a cisco company	2	0.0002
1065	scientific technologies inc	1	0.0001
1065	scientificatlanta inc	1	0.0001
102	scilog inc	340	0.0265
1065	scinets	1	0.0001
1065	scitex corporation ltd	1	0.0001
618	scosche industries inc	4	0.0003
1065	screen subtitling systems ltd	1	0.0001
697	seagate technology	3	0.0002
836	sealevel systems inc	2	0.0002
836	seamicro inc	2	0.0002
1065	secomindustry coltd	1	0.0001
1065	secura key	1	0.0001
1065	securaplane technologies inc	1	0.0001
1065	securifi ltd	1	0.0001
1065	security dynamics technologies inc	1	0.0001
1065	seenergy corp	1	0.0001
1065	seidel elektronik gmbh nfgkg	1	0.0001
396	sema electronicshk coltd	12	0.0009
1065	semindia system private limited	1	0.0001
836	semptian technologies ltd	2	0.0002
336	sena technologies inc	19	0.0015

Rank	Manufacturer Name	No.	%
92	senao international co ltd	413	0.0321
383	sencore	13	0.001
1065	senea ab	1	0.0001
1065	sennheiser communications as	1	0.0001
836	seoultek valley	2	0.0002
65	seowonintech co ltd	919	0.0715
836	seowoo inc	2	0.0002
282	sercomm corp	27	0.0021
179	sercomm corporation	95	0.0074
1065	setrix gmbh	1	0.0001
1065	sevis systems	1	0.0001
69	seyeon tech co ltd	664	0.0517
1065	sfr	1	0.0001
1065	sgm technology for lighting spa	1	0.0001
1065	shandong new beiyang information technology coltd	1	0.0001
122	shanghai bellmann digital source coltd	239	0.0186
132	shanghai broadmobi communication technology co ltd	183	0.0142
1065	shanghai dare technologies co ltd	1	0.0001
17	shanghai dare technologies coltd	8499	0.6613
396	shanghai dareglobal technologies coltd	12	0.0009
324	shanghai dareglobal technologies co ltd	20	0.0016
28	shanghai dareglobal technologies coltd	4338	0.3375
836	shanghai digivision technology co ltd	2	0.0002
30	shanghai feixun communication coltd	3421	0.2662
240	shanghai wdk industrial coltd	44	0.0034
261	shanghai xun shi communications equipment ltd co	35	0.0027
1065	sharp takaya electronics industry coltd	1	0.0001
230	shehzhen huawei communication technologies co ltd	47	0.0037
91	shenzhen 10moons technology development coltd	417	0.0324
618	shenzhen afoundry electronic co ltd	4	0.0003
618	shenzhen allywll	4	0.0003
1065	shenzhen baoan fenda industrial co ltd	1	0.0001
240	shenzhen chuangweirgb electronics colt	44	0.0034
13	shenzhen coship electronics co ltd	19533	1.5199
58	shenzhen coship software coltd	1150	0.0895
113	shenzhen egreat tech corpltd	287	0.0223
222	shenzhen forward industry co ltd	51	0.004
3	shenzhen gongjin electronics co ltd	108929	8.4757
618	shenzhen hexicom technology co ltd	4	0.0003
98	shenzhen huawei communication technologies co ltd	372	0.0289
836	shenzhen huawei communication technologies coltd	2	0.0002
1065	shenzhen huitaiwei tech ltd co	1	0.0001
836	shenzhen linnking electronics coltd	2	0.0002
240	shenzhen ogemray technology co ltd	44	0.0034
442	shenzhen prayfly technology coltd	9	0.0007
257	shenzhen reach software technology coltd	38	0.003
442	shenzhen richerlink technologies coltd	9	0.0007
1065	shenzhen sea star technology coltd	1	0.0001
1065	shenzhen shixuntong information & technoligy co	1	0.0001
618	shenzhen smarteye digital electronics co ltd	4	0.0003
1065	shenzhen state micro technology co ltd	1	0.0001
87	shenzhen streaming video technology company limited	454	0.0353
1065	shenzhen torch equipment co ltd	1	0.0001
354	shenzhen tplink technologies co ltd	16	0.0012
174	shenzhen tplink technology co; ltd	98	0.0076
697	shenzhen turbosight technology ltd	3	0.0002
270	shenzhen wistar technology co ltd	30	0.0023
172	shenzhen zhengjili electronics co ltd	105	0.0082
1065	shenzhenshi chuangzhicheng technology coltd	1	0.0001
836	shin satellite public company limited	2	0.0002
1065	shin wang tech	1	0.0001

Rank	Manufacturer Name	No.	%
1065	shindengen electric mfg co ltd	1	0.0001
189	shinheung precision co ltd	74	0.0058
836	shinsei industries coltd	2	0.0002
1065	shireen inc	1	0.0001
1065	shoei electric coltd	1	0.0001
697	shuttle inc	3	0.0002
618	si2 microsystems limited	4	0.0003
84	sichuan changhong electric ltd	471	0.0366
52	sichuan jiuzhou electronic technology coltd	1341	0.1043
1065	sichuan tianyi information science & technology stock coltd	1	0.0001
1065	sichuan whayer information industry coltd	1	0.0001
1065	sid informatica	1	0.0001
697	sidsa	3	0.0002
836	sielox llc	2	0.0002
276	siemens ag	29	0.0023
1065	siemens ag a&d et	1	0.0001
1065	siemens ag infrastructure & cities sector building technologies division	1	0.0001
1065	siemens austria simea	1	0.0001
167	sigma designs inc	114	0.0089
836	sigmatel inc	2	0.0002
1065	signal communication inc	1	0.0001
1065	signal technology aisd	1	0.0001
1065	silcom manufg technology inc	1	0.0001
481	silink	7	0.0005
1065	silver spring networks inc	1	0.0001
1065	simcom wireless solutions coltd	1	0.0001
229	simpact	48	0.0037
836	simrad as	2	0.0002
697	sindoricoh	3	0.0002
836	singular technology co ltd	2	0.0002
559	siqura bv	5	0.0004
1065	sirit inc	1	0.0001
836	sitecom europe bv	2	0.0002
1065	sk telesys	1	0.0001
125	skyworth digital technologyshenzhencoltd	201	0.0156
1065	sling media inc	1	0.0001
618	sm information & communication	4	0.0003
1065	sma railway technology gmbh	1	0.0001
1065	smart modular technologies	1	0.0001
836	smart storage systems	2	0.0002
1065	smart technologies inc	1	0.0001
68	smartlink network systems limited	671	0.0522
1065	smartware	1	0.0001
221	smc networks	52	0.004
81	smc networks inc	495	0.0385
2	smd informatica sa	109406	8.5128
1065	snedfar technology co ltd	1	0.0001
1065	snr inc	1	0.0001
697	soam systel	3	0.0002
836	soc coop bilanciai	2	0.0002
1065	softbook press	1	0.0001
1065	softcom as	1	0.0001
1065	solarflare communications inc	1	0.0001
324	solteras inc	20	0.0016
1065	soma networks inc	1	0.0001
14	sony computer entertainment inc	17042	1.326
1065	sony corporation	1	0.0001
481	sony ericsson mobile communications	7	0.0005
1065	sotas inc	1	0.0001
1065	southwing sl	1	0.0001
1065	space cyberlink inc	1	0.0001

Rank	Manufacturer Name	No.	%
697	space exploration technologies	3	0.0002
1065	spacebridge semiconductor corp	1	0.0001
249	sparklan communications inc	41	0.0032
618	spe systemhaus gmbh	4	0.0003
1065	spectra logic	1	0.0001
1065	spectrum digital inc	1	0.0001
1065	speech design gmbh	1	0.0001
836	spidcom technologies sa	2	0.0002
373	spur products corp	14	0.0011
89	ssangyong computer systems	425	0.0331
1065	staccato communications inc	1	0.0001
1065	standard microsystems	1	0.0001
396	star micronics coltd	12	0.0009
1065	starbridge networks	1	0.0001
170	stardot technologies	110	0.0086
1065	stargen inc	1	0.0001
559	stec electronics ag	5	0.0004
165	stl solution coltd	117	0.0091
697	stmicroelectronics	3	0.0002
559	stoeber antriebstechnik gmbh + co kg	5	0.0004
1065	stolinx inc	1	0.0001
383	storage appliance corporation	13	0.001
697	storeage networking technologies	3	0.0002
1065	storlink semiconductors inc	1	0.0001
1065	stralfors ab	1	0.0001
1065	stratacom	1	0.0001
1065	stratalight communications inc	1	0.0001
1065	streamit	1	0.0001
1065	stryker corporation	1	0.0001
836	style flying technology co	2	0.0002
559	suga electronics limited	5	0.0004
481	suhdol e&c coltd	7	0.0005
1065	suminet communication technologies shanghai co ltd	1	0.0001
1065	sumitomo electric device innovations inc	1	0.0001
1065	sumitomo electric networks inc	1	0.0001
1065	sumitomo electric system solutions co ltd	1	0.0001
481	sun cupid technology hk ltd	7	0.0005
1065	sungil telecom co ltd	1	0.0001
1065	sunin telecom	1	0.0001
1065	sunix co ltd	1	0.0001
836	sunkwang electronics co ltd	2	0.0002
5	sunniwell cyber tech co ltd	93341	7.2628
1065	sunray co ltd	1	0.0001
354	super micro computer inc	16	0.0012
361	supermicro computer inc	15	0.0012
1065	superpower computer	1	0.0001
1065	surecom technology co	1	0.0001
836	sureman comp & commun corp	2	0.0002
1065	surgient networks inc	1	0.0001
161	suzhou keda technology coltd	124	0.0096
1065	svm microwaves sro	1	0.0001
836	sweex europe bv	2	0.0002
336	swegon ab	19	0.0015
1065	switched network technologies inc	1	0.0001
1065	switchgear and instrumentation ltd	1	0.0001
697	swsoft	3	0.0002
118	syabas technology amquest	254	0.0198
373	symantec corporation	14	0.0011
1065	symbol technologieswholly owned subsidiary of motorola	1	0.0001
200	symmetricom inc	63	0.0049
1065	symphox information co	1	0.0001

Rank	Manufacturer Name	No.	%
836	synectics systems limited	2	0.0002
18	synerjet international corp	7505	0.584
1065	synertronixx gmbh	1	0.0001
481	synology incorporated	7	0.0005
1065	synoptics limited	1	0.0001
697	syntrex inc	3	0.0002
1065	sysgen	1	0.0001
836	sysmate co ltd	2	0.0002
1065	sysnet telematica srl	1	0.0001
1065	system create corp	1	0.0001
697	system spa dept electronics	3	0.0002
147	systemonic ag	149	0.0116
1065	systems in progress holding gmbh	1	0.0001
1065	t&l information inc	1	0.0001
74	t&w electronics shenzhen coltd	574	0.0447
559	t&w electronicsshenzhencoltd	5	0.0004
1065	tabor electronics ltd	1	0.0001
1065	tachion networks inc	1	0.0001
1065	tactel ab	1	0.0001
1065	taekwang industrial co ltd	1	0.0001
1065	taelim electronics co ltd	1	0.0001
836	tagmaster ab	2	0.0002
1065	tahoe networks inc	1	0.0001
1065	taiguen technology shenzhen co ltd	1	0.0001
1065	taishan online technology co ltd	1	0.0001
697	taishin co ltd	3	0.0002
1065	taiwan first line elec corp	1	0.0001
1065	taiwan semiconductor co ltd	1	0.0001
1065	takamisawa cybernetics co ltd	1	0.0001
1065	takenaka seisakusho coltd	1	0.0001
1065	talent electric incorporated	1	0.0001
1065	talos system inc	1	0.0001
1065	tandberg storage asa	1	0.0001
103	tandberg telecom as	336	0.0261
222	taracom integrated products inc	51	0.004
1065	tarallax wireless inc	1	0.0001
1065	targa systems div l3 communications canada	1	0.0001
1065	targa systems ltd	1	0.0001
697	tasi inc	3	0.0002
481	tatung company	7	0.0005
1065	tc group as	1	0.0001
411	tcl technoly electronicshuizhoucoltd	11	0.0009
1065	teac corp r& d	1	0.0001
200	teamcast	63	0.0049
1065	tecan systems inc	1	0.0001
697	technical solutions inc	3	0.0002
1065	technically elite concepts	1	0.0001
1065	technodrive srl	1	0.0001
1065	technoholon corporation	1	0.0001
249	technologic systems	41	0.0032
697	technology advancement group inc	3	0.0002
61	teco as	1068	0.0831
1065	tecobest technology limited	1	0.0001
210	tecom co ltd	59	0.0046
1065	teknor microsysteme inc	1	0.0001
1065	tekram technology co ltd	1	0.0001
1065	tekron international ltd	1	0.0001
1065	teldat spj	1	0.0001
1065	telecardpribor ltd	1	0.0001
110	teledex llc	299	0.0233
1065	telekom research and development sdn bhd	1	0.0001

Rank	Manufacturer Name	No.	%
836	telematica sistems inteligente	2	0.0002
1065	televic nv	1	0.0001
1065	teleware network systems	1	0.0001
1065	telewell oy	1	0.0001
1065	telewise communications inc	1	0.0001
270	telindus distribution	30	0.0023
191	tellion inc	72	0.0056
559	tellord	5	0.0004
1065	tellus group corp	1	0.0001
1065	telogy networks inc	1	0.0001
836	telsey spa	2	0.0002
1065	telspec ltd	1	0.0001
836	teltonika	2	0.0002
139	tenda technology co ltd	170	0.0132
1065	teneros inc	1	0.0001
1065	tenovis gmbh & co kg	1	0.0001
1065	tentel comtech co ltd	1	0.0001
1065	terabytes server storage tech corp	1	0.0001
53	teraview technology co ltd	1336	0.104
1065	terawave communications inc	1	0.0001
154	teraworks co ltd	136	0.0106
1065	terra	1	0.0001
1065	tervela	1	0.0001
1065	tesco controls inc	1	0.0001
1065	testo ag	1	0.0001
426	texas digital systems	10	0.0008
354	texas instruments	16	0.0012
836	thai radio co ltd	2	0.0002
1065	thales etransactions gmbh	1	0.0001
836	the linksys group inc	2	0.0002
1065	thomson csf	1	0.0001
1065	thomson inc	1	0.0001
222	thomson telecom belgium	51	0.004
697	tibetsystem	3	0.0002
442	tiger netcom	9	0.0007
1065	tilera corporation	1	0.0001
836	tilgin ab	2	0.0002
204	timekeeping systems inc	62	0.0048
282	timeplex inc	27	0.0021
697	timeware ltd	3	0.0002
1065	tiscali uk ltd	1	0.0001
1065	tiva microcomputer corp tmc	1	0.0001
1065	tivo	1	0.0001
411	tkh security solutions usa	11	0.0009
1065	tks usa inc	1	0.0001
411	toho technology corp	11	0.0009
1065	tokyo aircaft instrument co ltd	1	0.0001
836	tokyo radar corporation	2	0.0002
245	topfield co ltd	42	0.0033
1065	toptrendmeta information shenzhen inc	1	0.0001
618	topview technology corporation	4	0.0003
697	toradex ag	3	0.0002
697	toshiba	3	0.0002
481	total wireless technologies pte ltd	7	0.0005
1065	toyo network systems & system integration co ltd	1	0.0001
1065	toyolinx co ltd	1	0.0001
184	tplink technologies co ltd	82	0.0064
245	tplink technologies coltd	42	0.0033
1065	tplink technology co ltd	1	0.0001
1065	tps	1	0.0001
426	tq components gmbh	10	0.0008

Rank	Manufacturer Name	No.	%
697	transcon electronic systems spol s r o	3	0.0002
836	translogic corporation	2	0.0002
1065	transmedia communications inc	1	0.0001
1065	trebing & himstedt prozeÃƒÅ¸automation gmbh & co kg	1	0.0001
396	trendnet	12	0.0009
33	tribe computer works inc	3165	0.2463
1065	trident tek inc	1	0.0001
618	trimm inc	4	0.0003
516	trison technology corporation	6	0.0005
280	triz communications	28	0.0022
1065	truen	1	0.0001
289	trw seddinp	25	0.0019
207	tulip computers internatl bv	60	0.0047
1065	tutankhamon electronics	1	0.0001
1065	tvips as	1	0.0001
4	tvt coltd	98494	7.6638
1065	twinhan technology coltd	1	0.0001
836	tyan computer corp	2	0.0002
1065	tzero technologies inc	1	0.0001
1065	u10 networks inc	1	0.0001
307	ubicod coltd	22	0.0017
1065	ubiquam coltd	1	0.0001
361	ubiquiti networks	15	0.0012
336	ubiquiti networks inc	19	0.0015
1065	ubisense limited	1	0.0001
836	ubixon co ltd	2	0.0002
1065	udtech japan corporation	1	0.0001
1065	ultra electronics manufacturing and card systems	1	0.0001
1065	ultrak inc	1	0.0001
1065	umedia communications inc	1	0.0001
361	unatech coltd	15	0.0012
1065	ungermannbass inc	1	0.0001
1065	unicess network inc	1	0.0001
836	uniclass technology co ltd	2	0.0002
697	unidata communication systems inc	3	0.0002
697	uniden corporation	3	0.0002
1065	unigen corporation	1	0.0001
1065	unigrand ltd	1	0.0001
1065	unilink technology co ltd	1	0.0001
16	unionman technology coltd	9281	0.7221
244	uniphone inc	43	0.0033
54	unitec co ltd	1260	0.098
1065	united barcode industries	1	0.0001
1065	universal data systems	1	0.0001
44	universal global scientific industrial co ltd	1959	0.1524
618	universal microelectronics co	4	0.0003
1065	uniwill computer corp	1	0.0001
6	unknown	77555	6.0345
481	uriel systems inc	7	0.0005
1065	us beverage net	1	0.0001
1065	us robotics corporation	1	0.0001
516	us robotics inc	6	0.0005
836	usc corporation	2	0.0002
1065	usc information sciences inst	1	0.0001
836	utstarcom	2	0.0002
697	utstarcom inc	3	0.0002
1065	v center technologies co ltd	1	0.0001
836	vac	2	0.0002
1065	vadatech inc	1	0.0001
47	vadem	1809	0.1408
1065	valid networks inc	1	0.0001

Rank	Manufacturer Name	No.	%
618	value electronics	4	0.0003
836	valueplus inc	2	0.0002
1065	vansco electronics oy	1	0.0001
697	variscite ltd	3	0.0002
1065	vatech hydro	1	0.0001
1065	vda elettronica spa	1	0.0001
697	vector informatik gmbh	3	0.0002
836	venstar inc	2	0.0002
1065	verifone inc	1	0.0001
124	veritech electronics limited	224	0.0174
1065	verivue inc	1	0.0001
1065	versalynx corporation	1	0.0001
396	vestel komunikasyon sanayi ve ticaret as	12	0.0009
426	via networking technologies inc	10	0.0008
1065	viaas inc	1	0.0001
1065	viagate technologies inc	1	0.0001
836	vicon industries inc	2	0.0002
1065	vida design co	1	0.0001
1065	video products group	1	0.0001
1065	videofon mv	1	0.0001
1065	viditec inc	1	0.0001
1065	vieo inc	1	0.0001
697	viewsonic corporation	3	0.0002
836	vimicro corporation	2	0.0002
559	vimtron electronics co ltd	5	0.0004
1065	vipower inc	1	0.0001
1065	viseon inc	1	0.0001
1065	vision netware coltd	1	0.0001
324	visioncomm co ltd	20	0.0016
1065	vitana corporation	1	0.0001
1065	vitek industrial video products inc	1	0.0001
1065	vitelcom mobile technology	1	0.0001
1065	vive synergies inc	1	0.0001
256	vivotek inc	39	0.003
1065	vivox inc	1	0.0001
1065	vizimax inc	1	0.0001
1065	vizio inc	1	0.0001
836	vmware inc	2	0.0002
516	vocera communications	6	0.0005
1065	vogtechk co ltd	1	0.0001
351	volktek corporation	17	0.0013
1065	vosswinkel fu	1	0.0001
1065	vpnet inc	1	0.0001
336	vrmagic gmbh	19	0.0015
836	vtech engineering canada ltd	2	0.0002
1065	vtlinx multimedia systems inc	1	0.0001
1065	w l gore & associates	1	0.0001
442	w2 networks inc	9	0.0007
1065	w5networks	1	0.0001
1065	walchem corporation	1	0.0001
1065	wanlida group co ltd	1	0.0001
1065	wanzl metallwarenfabrik gmbh	1	0.0001
1065	wasabi systems inc	1	0.0001
1065	wasko sa	1	0.0001
1065	wavesat	1	0.0001
1065	wavesplitter technologies inc	1	0.0001
1065	waxess usa inc	1	0.0001
697	webpro technologies inc	3	0.0002
125	webwayone ltd	201	0.0156
836	weintek labs inc	2	0.0002
426	welcat inc	10	0.0008

Rank	Manufacturer Name	No.	%
1065	welch allyn inc	1	0.0001
1065	west australian department	1	0.0001
836	westermo teleindustri ab	2	0.0002
1065	western datacom co inc	1	0.0001
156	western digital	130	0.0101
289	western digital corporation	25	0.0019
559	wesung tnc co ltd	5	0.0004
1065	wibhu technologies inc	1	0.0001
1065	widefi inc	1	0.0001
112	wiflycity system inc	292	0.0227
836	wigear inc	2	0.0002
1065	wilife inc	1	0.0001
481	wiltron co	7	0.0005
1065	win leader inc	1	0.0001
1065	wincom systems inc	1	0.0001
1065	wincor nixdorf international gmbh	1	0.0001
1065	winix co ltd	1	0.0001
1065	winners electronics co ltd	1	0.0001
1065	winnet solutions limited	1	0.0001
173	winy technology co ltd	102	0.0079
383	wiscom system coltd	13	0.001
1065	wisembed	1	0.0001
618	wistron corp	4	0.0003
481	wistron corporation	7	0.0005
289	wistron neweb corp	25	0.0019
1065	wittenstein ag	1	0.0001
1065	wizyoung tech	1	0.0001
1065	woodwind communications system	1	0.0001
618	woonsang telecom inc	4	0.0003
1065	woori smt coltd	1	0.0001
120	wu han routon electronic co ltd	250	0.0195
697	wuhan hongxin telecommunication technologies coltd	3	0.0002
1065	wuxi keboda electron coltd	1	0.0001
1065	wyplay sas	1	0.0001
1065	x2 msa group	1	0.0001
1065	xaqti corporation	1	0.0001
127	xavi technologies corp	200	0.0156
1065	xeline co ltd	1	0.0001
171	xerox corporation	107	0.0083
361	xiamen overseas chinese electronic co ltd	15	0.0012
559	xiamen yealink network technology coltd	5	0.0004
1065	xilinx	1	0.0001
481	ximeta technology americas inc	7	0.0005
836	xortec oy	2	0.0002
1065	xstar networks inc	1	0.0001
1065	xstreamis plc	1	0.0001
559	xteam	5	0.0004
1065	xtraweb inc	1	0.0001
559	xts corp	5	0.0004
1065	xycom inc	1	0.0001
1065	yamaki electric corporation	1	0.0001
1065	yiqing co ltd	1	0.0001
1065	ymax telecom ltd	1	0.0001
559	yoko technology corp	5	0.0004
1065	yokogawa digital computer corp	1	0.0001
559	yournet inc	5	0.0004
361	yt elec coltd	15	0.0012
41	yuehuazhuhai electronic co ltd	2145	0.1669
1065	yushin precision equipment coltd	1	0.0001
8	yuxing electronics company limited	37020	2.8805
50	zcom inc	1432	0.1114

Rank	Manufacturer Name	No.	%
1065	zed3	1	0.0001
1065	zellweger analytics inc	1	0.0001
1065	zeno information system	1	0.0001
836	zenway enterprise ltd	2	0.0002
836	zettamedia korea	2	0.0002
618	zeus wireless inc	4	0.0003
10	zhejiang dahua technology coltd	32744	2.5478
836	zhejiang uniview technologies co ltd	2	0.0002
1065	zhejiang yutong network communication co ltd	1	0.0001
836	zhiyuan eletronics coltd	2	0.0002
836	zhone technologies	2	0.0002
1065	zhong shan city litai electronic industrial co ltd	1	0.0001
1065	zhongshan general kmate electronics co ltd	1	0.0001
21	zhongxing telecom ltd	6505	0.5062
481	zhuhai raysharp technology co ltd	7	0.0005
1065	ziehl industrieelektronik gmbh + co kg	1	0.0001
80	zinwell corporation	501	0.039
618	zioncom	4	0.0003
64	zioncom technology coltd	924	0.0719
516	zksoftware inc	6	0.0005
697	znyx networks	3	0.0002
1065	zonet technology inc	1	0.0001
426	zoom networks inc	10	0.0008
199	zpsys coltd planning&management	64	0.005
1	zte corporation	353436	27.5006
618	zuend systemtechnik ag	4	0.0003
618	zunidata systems inc	4	0.0003
516	zurich university of applied sciences	6	0.0005
1065	zyxel communication	1	0.0001
140	zyxel communications corp	167	0.013
166	zyxel communications corporation	115	0.0089