-CrescentSoftServices

- Introduction to Amazon EC2
- EC2 Benefits
- Use EC2
- EC2 Features
- Instance Types
- Pricing

- Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud
- Amazon EC2's simple web service interface allows you to obtain and configure capacity with minimal friction.
- It provides you with complete control of your computing resources and lets you run on Amazon's proven computing environment.
- Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing

you to **quickly scale capacity, both up and down**, as your computing requirements change.

- Amazon EC2 changes the economics of computing by allowing you to **pay only for capacity that you actually use**.

- Amazon EC2 provides developers the tools to build failure resilient applications and isolate themselves from common failure scenarios

Amazon EC2 Benefits • Elastic Web-Scale Computing

Amazon EC2 enables you to increase or decrease capacity within minutes, not hours or days. You can commission one, hundreds or even thousands of server instances simultaneously because this is all controlled with **web service APIs**, your application can automatically **scale itself up and down** depending on its needs.

- **Completely Controlled**

You have complete control of your instances. You have root access to each one, and you can interact with them as you would any machine. You can stop your instance while retaining the data on your boot partition and then subsequently restart the same instance using web service APIs. Instances can be rebooted remotely using web service APIs. You also have access to console output of your instances.

- **Flexible Cloud Hosting Services**

You have the choice of multiple **instance types**, **operating systems**, and software packages. Amazon EC2 allows you to select a configuration of **memory, CPU, instance storage**, and the boot partition size that is optimal for your choice of operating system and application. For example, your choice of operating systems includes numerous Linux distributions, and Microsoft Windows Server.

- **Designed for use with other Amazon Web Services**

Amazon EC2 works in conjunction with Amazon Simple Storage Service (Amazon S3), Amazon Relational Database Service (Amazon RDS), Amazon SimpleDB and Amazon Simple Queue Service (Amazon SQS) to provide a complete solution for computing, query processing and storage across a wide range of applications.

- **Reliable**

Amazon EC2 offers a highly reliable environment where replacement instances can be rapidly and predictably commissioned. The service runs within Amazon's proven network infrastructure and data centers. The Amazon EC2 Service Level Agreement commitment is **99.95% availability** for each Amazon EC2 Region.

Secure

- Amazon EC2 works in conjunction with **Amazon VPC** to provide security and robust networking functionality for your compute resources.

- Your compute instances are located in a Virtual Private Cloud (VPC) with an IP range that you specify. You decide which instances are **exposed to the Internet** and which remain **private**.
- **Security Groups** and networks ACLs allow you to control inbound and outbound network access to and from your instances.
- You can connect your existing IT infrastructure to resources in your VPC using industry-standard encrypted IPsec **VPN** connections.
- You can provision your EC2 resources as **Dedicated** Instances. Dedicated Instances are Amazon EC2 Instances that run on hardware dedicated to a **single customer** for additional isolation.
- If you do not have a **default VPC** you must create a VPC and launch instances into that VPC to leverage advanced networking features such as private subnets, outbound security group filtering, network ACLs, Dedicated Instances, and VPN connections.

Inexpensive

Amazon EC2 passes on to you the financial benefits of Amazon's scale. You pay a very low rate for the compute capacity you actually consume. See Amazon EC2 Instance Purchasing Options for a more detailed description.

- **On-Demand Instances** – On-Demand Instances let you pay for compute capacity by the hour with no long-term commitments.
- This frees you from the costs and complexities of planning, purchasing, and maintaining hardware and transforms what are commonly large fixed costs into much smaller variable costs.

Reserved Instances

- Reserved Instances provide you with a significant discount (up to 75%) compared to OnDemand Instance pricing.
- There are three Reserved Instance payment options (No Upfront, Partial Upfront, All Upfront) that enable you to balance the amount you pay upfront with your effective hourly price.
- The Reserved Instance Marketplace is also available, which provides you with the

opportunity to sell Reserved Instances if your needs change.

Examples:

You want to move instances to a new AWS Region, change to a new instance type, or sell capacity for projects that end before your Reserved Instance term expires).

Spot Instances

- Spot Instances allow customers to bid on unused Amazon EC2 capacity and run those instances for as long as their bid exceeds the current Spot Price.

To use Amazon EC2, you simply:

- Select a pre-configured, template Amazon Machine Image (AMI) to get up and running immediately. Or create an AMI containing your applications, libraries, data, and associated configuration settings.
- Configure security and network access on your Amazon EC2 instance..
- Choose which instance type(s) you want, then start, terminate, and monitor as many instances of your AMI as needed, using the web service APIs or the variety of management tools provided.
- Determine whether you want to run in multiple locations, utilize static IP endpoints, or attach persistent block storage to your instances.
- Pay only for the resources that you actually consume, like instance-hours or data transfer.

Features

Amazon EC2 provides a number of powerful features for building scalable, failure resilient, enterprise class applications.

Amazon Elastic Block Store

- Amazon Elastic Block Store (EBS) offers persistent storage for Amazon EC2 instances.
- Amazon EBS volumes are network-attached, and persist independently from the life of an instance.

- Amazon EBS volumes are highly available, highly reliable volumes that can be leveraged as an Amazon EC2 instance's boot partition or attached to a running Amazon EC2 instance as a standard block device

EBS-Optimized Instances

- For an additional, low, hourly fee, customers can launch selected Amazon EC2 instances types as EBS-optimized instances

Multiple Locations

- Amazon EC2 provides the ability to place instances in multiple locations. Amazon EC2 locations are composed of Regions and Availability Zones. Availability Zones are distinct locations that are engineered to be insulated from failures in other Availability Zones and provide inexpensive, low latency network connectivity to other Availability Zones in the same Region. By launching instances in separate Availability Zones, you can protect your applications from failure of a single location. Regions consist of one or more Availability Zones, are geographically dispersed, and will be in separate geographic areas or countries

Elastic IP Addresses

- Elastic IP addresses are static IP addresses designed for dynamic cloud computing. An Elastic IP address is associated with your account not a particular instance, and you control that address until you choose to explicitly release it. Unlike traditional static IP addresses, however, Elastic IP addresses allow you to mask

  instance or Availability Zone failures by programmatically remapping your public IP addresses to any instance in your account

Amazon Virtual Private Cloud

- Amazon Virtual Private Cloud (Amazon **VPC**) lets you provision a **logically isolated** section of the Amazon Web Services (AWS) Cloud where you can launch AWS resources in a virtual network that you define.

- You have complete control over your virtual networking environment, including selection of your own IP address range, creation of **subnets**, and configuration of route tables and network gateways. You can also create a Hardware Virtual Private Network (**VPN**) connection between **your corporate datacenter and your VPC** and leverage the AWS cloud as an extension of your corporate datacenter

- **Amazon CloudWatch**

- Amazon CloudWatch is a web service that provides monitoring for AWS cloud resources and applications, starting with **Amazon EC2**. It provides you with visibility into resource **utilization, operational performance**, and overall demand patterns—including metrics such as **CPU utilization, disk reads and writes, and network traffic**. You can get statistics, view graphs, and set alarms for your metric data.

- To use Amazon CloudWatch, simply select the Amazon EC2 instances that you'd like to monitor. You can also supply your own business or application metric data. Amazon CloudWatch will begin aggregating and storing monitoring data that can be accessed using web service APIs or Command Line Tools

Auto Scaling

- Auto Scaling allows you to automatically scale your Amazon EC2 capacity up or down according to conditions you define.

- With Auto Scaling, you can ensure that the number of Amazon EC2 instances you're using scales up seamlessly during demand **spikes** to maintain **performance**, and scales down **automatically** during demand lulls to minimize costs.

- Auto Scaling is particularly well suited for applications that experience hourly, daily, or weekly variability in usage.

- Auto Scaling is enabled by **Amazon CloudWatch** and available at no additional charge beyond Amazon CloudWatch fees

Elastic Load Balancing

- Elastic Load Balancing automatically distributes incoming application traffic across multiple Amazon EC2 instances. It enables you to achieve even greater fault tolerance in your applications, seamlessly providing the amount of load balancing capacity needed in response to incoming application traffic

- **High Performance Computing (HPC) Clusters**

- Customers with complex computational workloads such as tightly coupled **parallel** processes, or with applications sensitive to network performance, can achieve the same high compute and network performance provided by custom-built infrastructure while benefiting from the elasticity, flexibility and cost advantages of Amazon EC2

GPU Instances

- Customers requiring high parallel performance capability will benefit from GPU instances, which provide access to **NVIDIA** GPUs each with up to 1,536 CUDA cores and 4GB of video memory. With the latest

driver releases, these GPUs provide support for OpenGL, DirectX, CUDA, OpenCL, and the GRID SDK. GPU instances are ideally suited for 3D graphics applications, including **game streaming**, and compute workloads, including **computational chemistry**, financial modeling, and engineering design.

High I/O Instances

- Customers requiring very high, low latency, random I/O access to their data can benefit from High I/O instances. High I/O instances are an Amazon EC2 instance type that can provide customers with random I/O rates over **100,000 IOPS. High I/O instances** are backed by Solid State Disk (SSD) technology and are ideally suited for customers running very high performance **NoSQL** and relational databases.

Dense Storage Instances

- Customers requiring very high storage density per instance, and high sequential I/O for data-intensive applications like Massively Parallel Processing (MPP) data warehouse, MapReduce and Hadoop distributed computing, and log and data processing can benefit from Dense Storage instances. Dense Storage instances are an Amazon EC2 instance type that can provide customers with sequential I/O throughout of up to 3.9 GB/s and provide customers with up to **48 TB of instance storage across 24 hard disk** drives

VM Import/Export

- VM Import/Export enables you to easily import virtual machine images from your existing environment to Amazon EC2 instances and export them back at any time

AWS Marketplace

- AWS Marketplace is an online store that helps you find, buy and quickly deploy software that runs on AWS. You can use AWS Marketplace's 1-Click deployment to quickly launch preconfigured software and be charged for what you use, by the hour or month. AWS handles billing and payments, and software charges appear on your AWS bill

Using Amazon EC2 to Run Instances

- Amazon EC2 allows you to set up and configure everything about your instances from your operating system up to your applications. An **Amazon Machine Image** (AMI) is simply a packaged-up environment that includes all the necessary bits to set up and boot your instance. Your AMIs are your unit of deployment

- If you wish to run **more than** 20 On-Demand or Reserved Instances or 20 Spot Instances, create more than 5,000 EBS volumes, need more than 5 Elastic IP addresses or 5 Elastic Load Balancers,

or need to send large quantities of email from your EC2 account, **please complet**e the Amazon EC2 instance request form, Amazon EBS volume request form, Elastic IP request form, Elastic Load Balancers, or the Email request form respectively and your request will be considered

- When you use AMIs, Microsoft software licensing is handled by AWS and included in your monthly bill

Instance Types

- General Purpose Instances
- T2 instances are Burstable Performance Instances that provide a baseline level of CPU performance with the ability to burst above the baseline. Instances in this family are ideal for applications that don't use the full CPU often or consistently, but occasionally need to burst (e.g. web servers, developer environments, and small databases).
- t2.micro: 1 GiB of memory, 1 vCPU, 6 CPU Credits/hour, EBS-only, 32 bit or 64-bit platform
- t2.small: 2 GiB of memory, 1 vCPU, 12 CPU Credits/hour, EBS-only, 32 bit or 64-bit platform
- t2.medium: 4 GiB of memory, 2 vCPUs, 24 CPU Credits/hour, EBS-only, 32 bit or 64-bit platform
- t2.large: 8 GiB of memory, 2 vCPUs, 36 CPU Credits/hour, EBS-only, 64 bit platform

Instance Types

- M4 instances are based on a custom Intel 2.4 GHz Xeon E5-2676 v3 Haswell processor with AVX2. M4 instances deliver fixed performance and provide customers with a set of resources for a high level of consistent processing performance on a low-cost platform. Instances in this family are ideal for applications that require balanced CPU and memory performance. Examples of applications that will benefit from the performance of General Purpose instances include encoding, high traffic content management systems, and other enterprise applications.
- m4.large: 8 GiB of memory, 2 vCPU, EBS-only, 64-bit platform
- m4.xlarge: 16 GiB of memory, 4 vCPUs, EBS-only, 64-bit platform
- m4.2xlarge: 32 GiB of memory, 8 vCPUs, EBS-only, 64-bit platform
- m4.4xlarge: 64 GiB of memory, 16 vCPUs, EBS-only, 64-bit platform m4.10xlarge: 160 GiB of

memory, 40 vCPUs, EBS-only, 64-bit platform

Instance Types

- M3 instances deliver fixed performance and provide customers with a set of resources for a high level of consistent processing performance on a low-cost platform. Instances in this family are ideal for applications that require balanced CPU and memory performance. Examples of applications that will benefit from the performance of General Purpose instances include encoding, high traffic content management systems, and other enterprise applications.
- m3.medium: 3.75 GiB of memory, 1 vCPU, 4 GB of SSD-based local instance storage, 64-bit platform
- m3.large: 7.5 GiB of memory, 2 vCPUs, 32 GB of SSD-based local instance storage, 64-bit platform
- m3.xlarge: 15 GiB of memory, 4 vCPUs, 80 GB of SSD-based local instance storage, 64-bit platform
- m3.2xlarge: 30 GiB of memory, 8 vCPUs, 160 GB of SSD-based local instance storage, 64-bit platform

Instance Types Compute Optimized Instances

- C4 instances are based on the Intel Xeon E5-2666 v3 ("Haswell") processor, and are designed to deliver the highest level of compute performance on Amazon EC2.
- c4.large: 3.75 GiB of memory, 2 vCPUs, 64-bit platform
- c4.xlarge: 7.5 GiB of memory, 4 vCPUs, 64-bit platform
- c4.2xlarge: 15 GiB of memory, 8 vCPUs, 64-bit platform
- c4.4xlarge: 30 GiB of memory, 16 vCPUs, 64-bit platform
- c4.8xlarge: 60 GiB of memory, 36 vCPUs, 64-bit platform

Instance Types

- C3 instances are based on high frequency Intel Xeon E5-2680 v2 ("Ivy Bridge") processors, and are designed for running compute-intensive applications.

- c3.large: 3.75 GiB of memory, 2 vCPUs, 32 GB of SSD-based local instance storage, 64-bit platform
- c3.xlarge: 7 GiB of memory, 4 vCPUs, 80 GB of SSD-based local instance storage, 64-bit platform
- c3.2xlarge: 15 GiB of memory, 8 vCPUs, 160 GB of SSD-based local instance storage, 64-bit platform
- c3.4xlarge: 30 GiB of memory, 16 vCPUs, 320 GB of SSD-based local instance storage, 64-bit platform
- c3.8xlarge: 60 GiB of memory, 32 vCPUs, 640 GB of SSD-based local instance storage, 64-bit platform

Instance Types GPU Instances

- Instances of this family provide graphics processing units (GPUs) along with high CPU and network performance for applications benefiting from highly parallelized processing, including 3D graphics, HPC, rendering, and media processing applications.
- g2.2xlarge: 15 GiB memory, 1 x NVIDIA GRID GPU (Kepler GK104), 60 GB of local instance storage, 64-bit platform
- g2.8xlarge: 60 GiB memory, 4 x NVIDIA GRID GPU (Kepler GK104), 240 GB of local instance storage, 64-bit platform

Instance Types Memory Optimized Instances

- Instances of this family offer large memory sizes for high throughput applications including relational and NoSQL databases, in-memory analytics solutions, scientific computing, and other memory-intensive applications.
- r3.large: 15.25 GiB of memory, 2 vCPUs, 1 x 32 GB of SSD-based instance storage, 64-bit platform
- r3.xlarge: 30.5 GiB of memory, 4 vCPUs, 1 x 80 GB of SSD-based instance storage, 64-bit platform

- r3.2xlarge: 61 GiB of memory, 8 vCPUs, 1 x 160 GB of SSD-based instance storage, 64-bit platform
- r3.4xlarge: 122 GiB of memory, 16 vCPUs, 1 x 320 GB of SSD-based instance storage, 64-bit platform
- r3.8xlarge: 244 GiB of memory, 32 vCPUs, 2 x 320 GB of SSD-based instance storage, 64-bit platform, 10 Gigabit Ethernet

Storage Optimized Instances

- Instances of this family provide very high disk I/O performance or proportionally higher storage density per instance, and are ideally suited for applications that benefit from high sequential I/O performance across very large data sets. Storage-optimized instances also provide high levels of CPU, memory and network performance.
- i2.xlarge: 30.5 GiB of memory, 4 vCPUs, 800 GB of SSD-based instance storage, 64-bit platform
- i2.2xlarge: 61 GiB of memory, 8 vCPUs, 2 x 800 GB of SSD-based instance storage, 64-bit platform
- i2.4xlarge: 122 GiB of memory, 16 vCPUs, 4 x 800 GB of SSD-based instance storage, 64-bit platform
- i2.8xlarge: 244 GiB of memory, 32 vCPUs, 8 x 800 GB of SSD-based instance storage, 64-bit platform, 10 Gigabit Ethernet
- Instances of this family provide low cost storage and very high disk throughput and are ideally suited for applications that benefit from high sequential I/O performance across very large datasets on local storage.
- d2.xlarge: 30.5 GiB of memory, 4 vCPUs, 3 x 2000 GB of HDD-based instance storage, 64-bit platform
- d2.2xlarge: 61 GiB of memory, 8 vCPUs, 6 x 2000 GB of HDD -based instance storage, 64-bit platform
- d2.4xlarge: 122 GiB of memory, 16 vCPUs, 12 x 2000 GB of HDD-based instance storage, 64-bit platform
- d2.8xlarge: 244 GiB of memory, 36 vCPUs, 24 x 2000 GB of HDD -based instance storage, 64-bit platform, 10 Gigabit Ethernet

Operating Systems and Software

Amazon Machine Images (AMIs) are preconfigured with an ever-growing list of operating systems

Amazon EC2 Pricing
Pay only for what you use. There is no minimum fee. Estimate your monthly bill using AWS Simple Monthly Calculator. The prices listed are based on the Region in which your instance is running

- **Free Tier***
- As part of AWS' s Free Tier, new AWS customers can get started with Amazon EC2 for free. Upon sign-up, new AWS customers receive the following EC2 services each month for one year:
- 750 hours of EC2 running Linux, RHEL, or SLES t2.micro instance usage
- 750 hours of EC2 running Microsoft Windows Server t2.micro instance usage
- 750 hours of Elastic Load Balancing plus 15 GB data processing
- 30 GB of Amazon Elastic Block Storage in any combination of General Purpose (SSD) or Magnetic, plus 2 million I/Os (with Magnetic) and 1 GB of snapshot storage
  15 GB of bandwidth out aggregated across all AWS services
- 1 GB of Regional Data Transfer

On-Demand Instances

- On-Demand Instances let you pay for compute capacity by the hour with no long-term commitments. This frees you from the costs and complexities of planning, purchasing, and maintaining hardware and transforms what are commonly large fixed costs into much smaller variable costs

On-Demand Instance Prices

Linux | RHEL | SLES | Windows | Windows with SQL Standard | Windows with SQL Web | Windows with SQL Enterprise

Region: US East (N. Virginia)

	vCPU	ECU	Memory (GiB)	Instance Storage (GB)	Linux/UNIX Usage
General Purpose - Current Generation					
t2.micro	1	Variable	1	EBS Only	$0.013 per Hour
t2.small	1	Variable	2	EBS Only	$0.026 per Hour
t2.medium	2	Variable	4	EBS Only	$0.052 per Hour
t2.large	2	Variable	8	EBS Only	$0.104 per Hour
m4.large	2	6.5	8	EBS Only	$0.126 per Hour
m4.xlarge	4	13	16	EBS Only	$0.252 per Hour

Data Transfer

- The pricing below is based on data transferred "in" to and "out" of Amazon EC2.

Region: US East (N. Virginia)

	Pricing
Data Transfer IN To Amazon EC2 From	
Internet	$0.00 per GB
Another AWS Region (from any AWS Service)	$0.00 per GB
Amazon S3, Amazon Glacier, Amazon DynamoDB, Amazon SES, Amazon SQS, or Amazon SimpleDB in the same AWS Region	$0.00 per GB
Amazon EC2, Amazon RDS, Amazon Redshift and Amazon ElastiCache instances or Elastic Network Interfaces in the same Availability Zone	
Using a private IP address	$0.00 per GB
Using a public or Elastic IP address	$0.01 per GB
Amazon EC2, Amazon RDS, Amazon Redshift and Amazon ElastiCache instances or Elastic Network Interfaces in another Availability Zone or peered VPC in the same AWS Region	$0.01 per GB

Data Transfer OUT From Amazon EC2 To

Amazon S3, Amazon Glacier, Amazon DynamoDB, Amazon SES, Amazon SQS, or Amazon SimpleDB in the same AWS Region	$0.00 per GB
Amazon EC2, Amazon RDS, Amazon Redshift or Amazon ElastiCache instances, Amazon Elastic Load Balancing, or Elastic Network Interfaces in the same Availability Zone	
Using a private IP address	$0.00 per GB
Using a public or Elastic IP address	$0.01 per GB
Amazon EC2, Amazon RDS, Amazon Redshift or Amazon ElastiCache instances, Amazon Elastic Load Balancing, or Elastic Network Interfaces in another Availability Zone or peered VPC in the same AWS Region	$0.01 per GB
Another AWS Region	$0.02 per GB
Amazon CloudFront	$0.00 per GB

Data Transfer OUT From Amazon EC2 To Internet

First 1 GB / month	$0.00 per GB
Up to 10 TB / month	$0.09 per GB
Next 40 TB / month	$0.085 per GB
Next 100 TB / month	$0.07 per GB
Next 350 TB / month	$0.05 per GB
Next 524 TB / month	Contact Us
Next 4 PB / month	Contact Us
Greater than 5 PB / month	Contact Us

Elastic IP Addresses

You can have one Elastic IP (EIP) address associated with a running instance at no charge. If you associate additional EIPs with that instance, you will be charged for each additional EIP associated with that instance per hour on a pro rata basis. Additional EIPs are only available in Amazon VPC.

To ensure efficient use of Elastic IP addresses, we impose a small hourly charge when these IP addresses are not associated with a running instance or when they are associated with a stopped instance or unattached network interface.

Region:US East (N. Virginia)

$0.00 for one Elastic IP address associated with a running instance

$0.005 per additional Elastic IP address associated with a running instance per hour on a pro rata basis

$0.005 per Elastic IP address not associated with a running instance per hour on a pro rata basis

$0.00 per Elastic IP address remap for the first 100 remaps per month

$0.10 per Elastic IP address remap for additional remaps over 100 per month

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Region:US East (N. Virginia)

$0.00 for one Elastic IP address associated with a running instance

$0.005 per additional Elastic IP address associated with a running instance per hour on a pro rata basis

$0.005 per Elastic IP address not associated with a running instance per hour on a pro rata basis

$0.00 per Elastic IP address remap for the first 100 remaps per month

$0.10 per Elastic IP address remap for additional remaps over 100 per month

Amazon CloudWatch

Region:US East (N. Virginia) Detailed Monitoring for Amazon EC2 Instances

$3.50 per instance per month for Detailed Monitoring at 1-minute frequency

Amazon CloudWatch Custom Metrics

$0.50 per metric per month

Amazon CloudWatch Alarms

$0.10 per alarm per month

Amazon CloudWatch API Requests

$0.01 per 1,000 GetMetricStatistics, ListMetrics, or PutMetricData requests

Amazon CloudWatch Logs*

$0.50 per GB ingested**

$0.03 per GB archived per month***

Amazon CloudWatch

Region:US East (N. Virginia)

Detailed Monitoring for Amazon EC2 Instances

$3.50 per instance per month for Detailed Monitoring at 1-minute frequency

Amazon CloudWatch Custom Metrics

$0.50 per metric per month

Amazon CloudWatch Alarms

$0.10 per alarm per month

Amazon CloudWatch API Requests

$0.01 per 1,000

GetMetricStatistics, ListMetrics, or PutMetricData requests

Amazon CloudWatch Logs*

$0.50 per GB ingested**

$0.03 per GB archived per month**

Auto Scaling

Auto Scaling is enabled by Amazon CloudWatch and carries no additional fees. Each instance launched by Auto Scaling is automatically enabled for monitoring and the applicable Amazon Cloudwatch charges will be applied.

Elastic Load Balancing Region:US East (N. Virginia)

$0.025 per Elastic Load Balancer-hour (or partial hour)

$0.008 per GB of data processed by an Elastic Load Balancer

What is PEM Format?
PEM or Privacy Enhanced Mail is a Base64 encoded DER certificate. PEM certificates are frequently used for web servers as they can easily be translated into readable data using a simple text editor. Generally when a PEM encoded file is opened in a text editor, it contains very distinct headers and footers. (DER=Distinguished Encoding Rules)

Ex:

----- BEGIN CERTIFICATE REQUEST-----
MIIB9TCCAWACAQAwgbgxGTAXBgNVBAoMEFF1b1ZhZGlzIExpbWl0ZWQxHDAaBgNV
BAsME0RvY3VtZW50IERlcGFydG1lbnQxOTA3BgNVBAMMMFdoeSBhcmUgeW91IGRl
Y29kaW5nIG1lPyAgVGhpcyBpcyBvbmx5IGEgdGVzdCEhITERMA8GA1UEBwwISGFt
aWx0b24xETAPBgNVBAgMC FBlbWJyb2tlMQswCQYDVQQGEwJCTTEPMA0GCSqGSIb3
DQEJARYAMIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQCJ9WRanG/fUvcfKiGl
EL4aRLjGt537mZ28UU9/3eiJeJznNSOuNLnF+hmabAu7H0LT4K7EdqfF+XUZW/2j
RKRYcvOUDGF9A7OjW7UfKk1In3+6QDCi7X34RE161jqoaJjrm/T18TOKcgkkhRzE
apQnIDm0Ea/HVzX/PiSOGuertwIDAQABMAsGCSqGSIb3DQEBBQOBgQBzMJdAV4QP
Awel8LzGx5uMOshezF/KfP67wJ93UW+N7zXY6AwPgoLj4Kjw+WtU684JL8Dtr9FX
ozakE+8p06BpxegR4BR3FMHf6p+0jQxUEAkAyb/mVgm66TyghDGC6/YkiKoZptXQ
98 TwDIK/39WEB/V607As+KoYazQG8drorw==
-----END CERTIFICATE REQUEST-----

Above is the example of a CSR (certificate signing request) in PEM format. You can see that PEM has the characteristics of containing a header, the body (which consists mainly of code) and footer.

The header and footer is what identifies the type of file, however be aware that not all PEM files necessarily need them.

-----BEGIN CERTIFICATE REQUEST----- and -----END CERTIFICATE REQUEST----- show a CSR in PEM format.
-----BEGIN RSA PRIVATE KEY----- and ----- END RSA PRIVATE KEY----- show a private key in PEM format.
-----BEGIN CERTIFICATE----- and ----- END CERTIFICATE----- show a certificate file in PEM format.

WHAT IS A .PPK FILE?

- Files created by PuTTYgen are known as PPK files
- These files are used to enable communication securely with another party having the corresponding public key.
  - PPK files contain information about key file authentication which is why they usually serve as the computer's marker that could allow the recognition and utilization of the files using the Putty software.
  - The putty software is the main application using PPK files. This application is useful for SSH and Telnet. If users want to authenticate PPK files, all they need to do is choose Connection → SSH → Auth which can be found on the PuTTY Configuration menu. Then after that, they can click on Browse to enable the option called Private Key file for authentication.
  - PPK files as well as the Putty software that c reated them can be opened on Windows, UNIX and MAC systems