ECE560
Computer and Information Security

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Cloud Security

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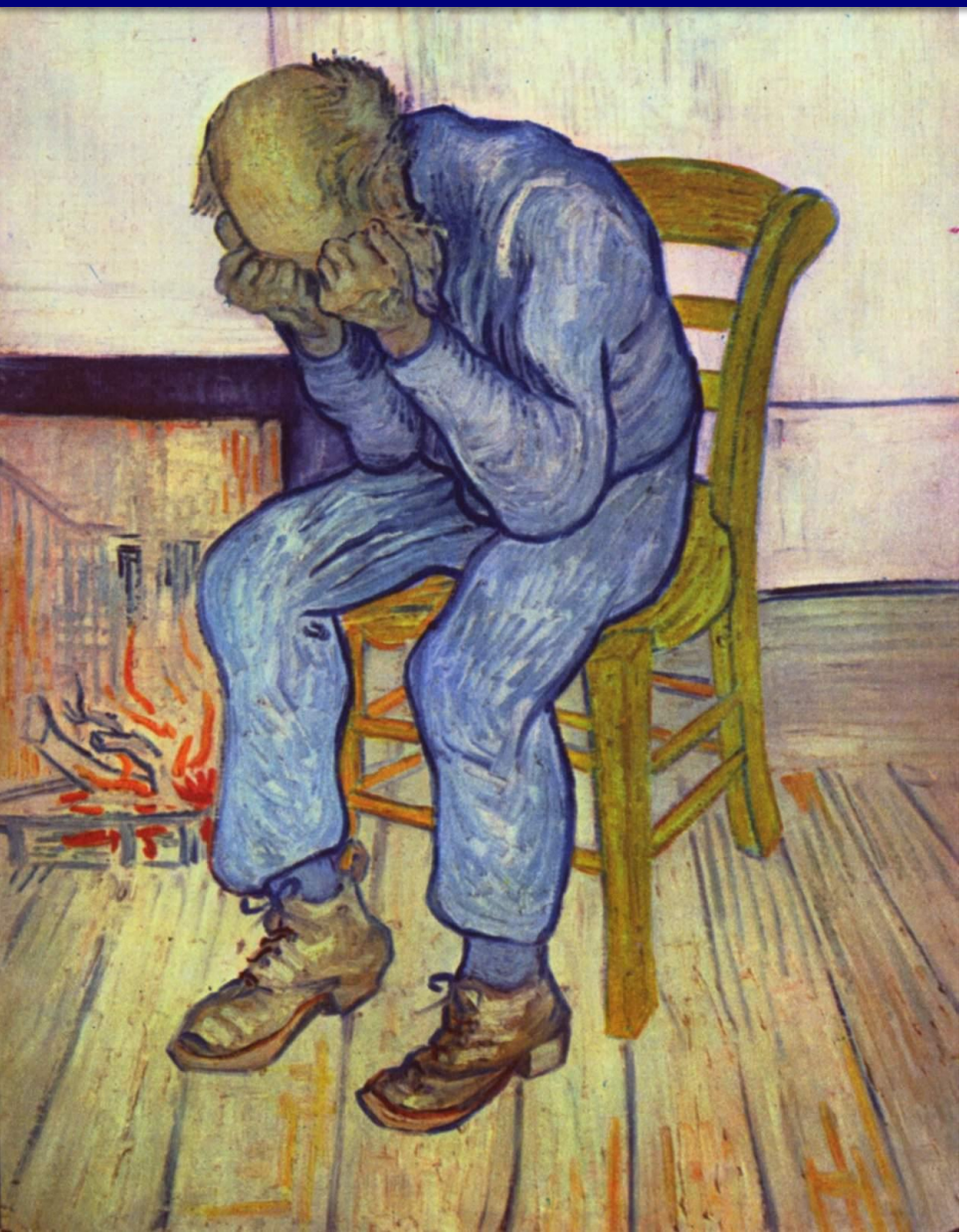
CLOUD



- What is it?
  - Most overused and abused buzzword of the 21st century.

Cloud

- What is it?
  - It's when you borrow a computer over a network.
  - That's all.

- Lots of ways to "borrow".
- Lots of kinds of "computer".
- Lots of kinds of "network".

- Marketing nonsense was so bad the National Institute of Standards and Technology (NIST) produced a definition which most people go by now

What is Cloud Computing?

Cloud Computing

A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., servers, storage, networks, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

– NIST

- Essential Cloud characteristics
  - On-demand self-service
  - Broad network access
  - Resource pooling
  - Rapid elasticity
  - Measured service

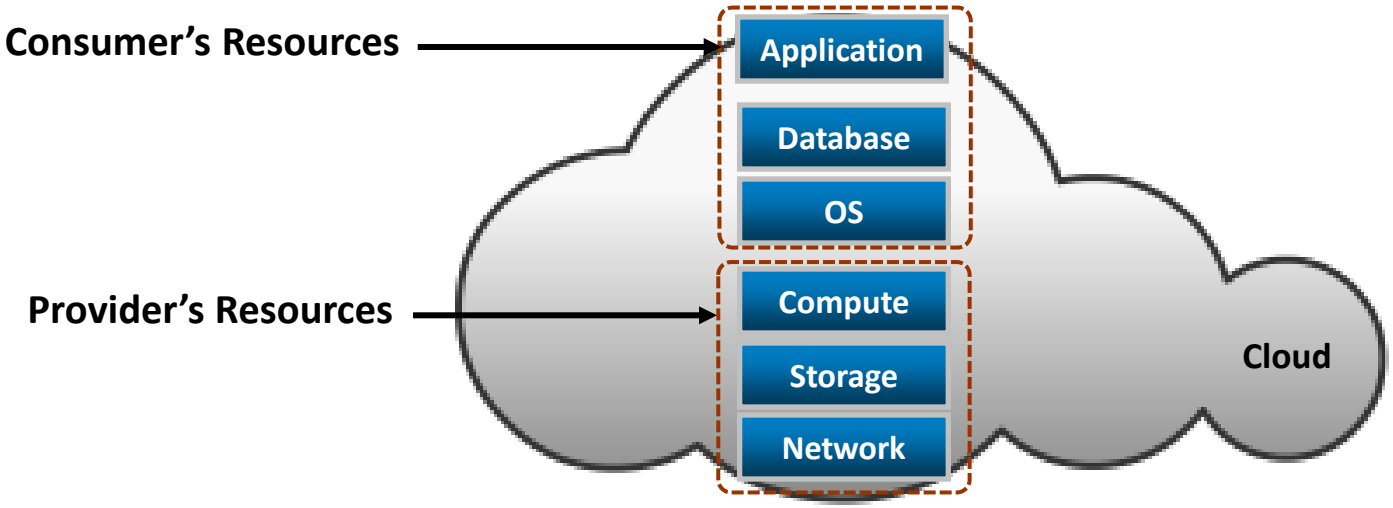
Cloud Service Models

- Infrastructure-as-a-Service (IaaS)
- Platform-as-a-Service (PaaS)
- Software-as-a-Service (SaaS)

- Storage-as-a-Service (StaaS)
- Tons of other stuff -as-a-Service (XaaS)

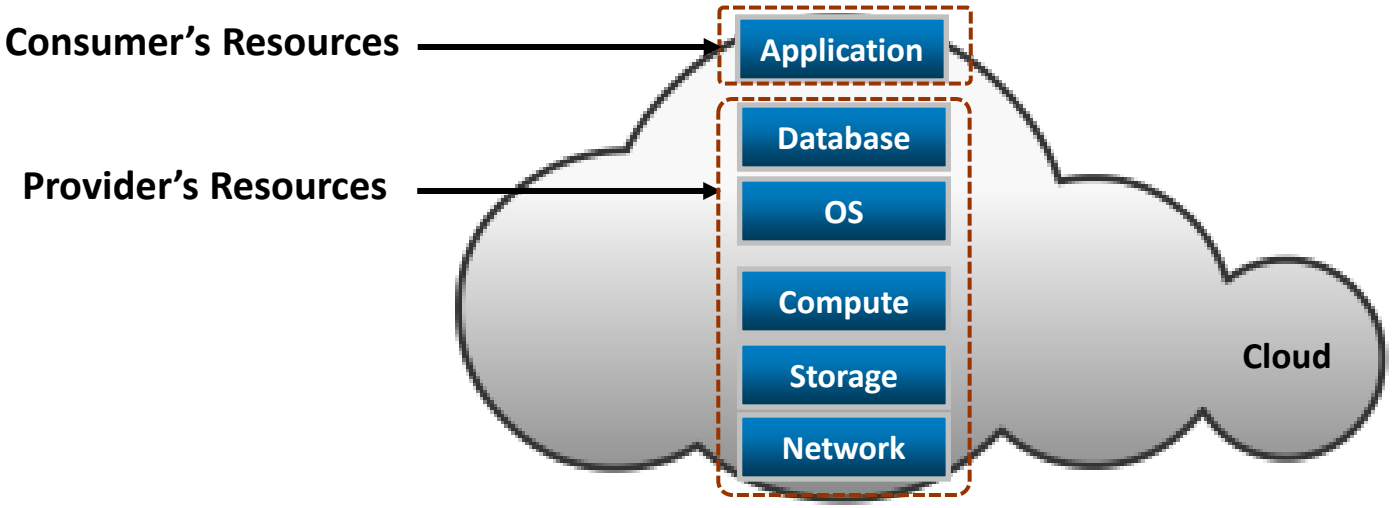
Infrastructure-as-a-Service

- Consumers deploy their software, including OS and application on provider's infrastructure
  - Computing resources such as processing power, memory, storage, and networking components are offered as service
  - Example: Amazon Elastic Compute Cloud
- Consumers have control over the OSs and deployed applications



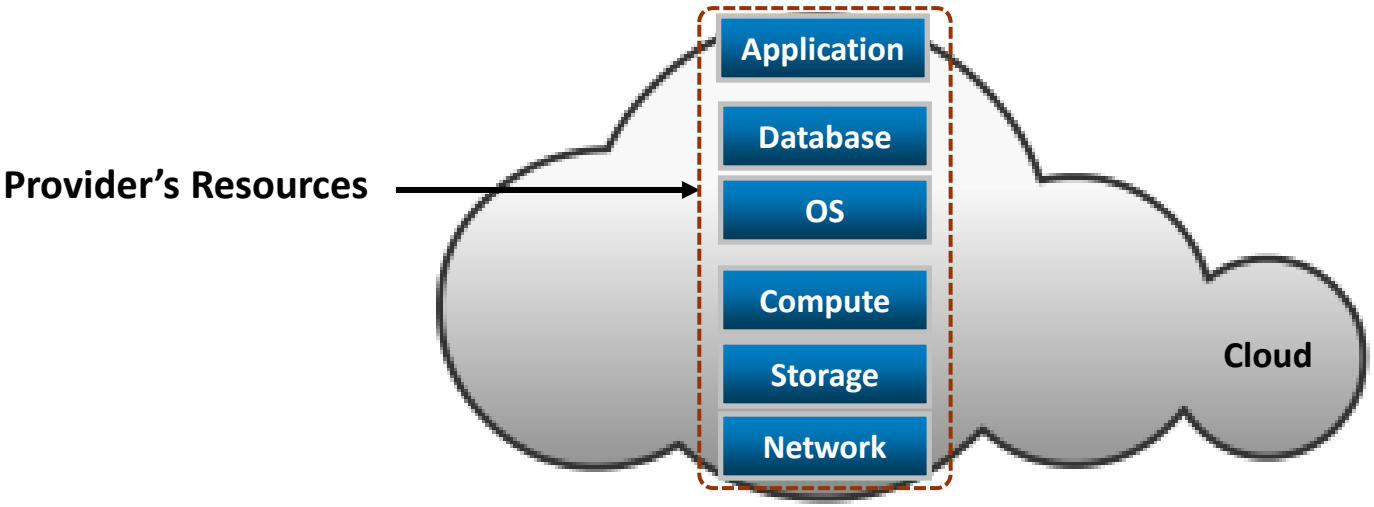
Platform-as-a-Service

- Consumers deploy consumer-created or acquired applications onto provider's computing platform
  - Computing platform is offered as a service
  - Example: Google App Engine and Microsoft Windows Azure Platform
- Consumer has control over deployed applications



Software-as-a-Service

- Consumers use provider's applications running on the cloud infrastructure
  - Applications are offered as a service
  - Examples: EMC Mozy and Salesforce.com
- Service providers exclusively manage computing infrastructure and software to support services



Cloud security threats

- *All the traditional threats, plus...*

- Cross-tenant data or access leakage
  - What if Coke and Pepsi are running VMs on the same physical machine?
  - Loss of hypervisor integrity compromises whole organizations now!
  - Also: networks, storage, etc.
- Access rights issues
  - There are SO MANY stories of data leaks from Amazon S3 set to world-readable
    - E.g.: This major ISP leaked plaintext passwords, secret keys, and more
- Cloud command-and-control issues
  - Previous student group in Prof. Board's cloud computing class leaked AWS credentials; attackers racked up $30,000 in service charges in a few days!
- Cloud provider has access to all your data!
  - This may be a legal liability *and* a security concern

Cloud Security As A Service

- SecaaS
- Is a segment of the SaaS offering of a CP
- Defined by The Cloud Security Alliance as the provision of security applications and services via the cloud either to cloud-based infrastructure and software or from the cloud to the customers' on-premise systems

This is bolt-on-security dumbness to appease people who want security to be easy and automatic (and we know it's not).

Can a VM running network intrusion detection software be helpful? Yes.

Does that solve security? No.

Is it useful to call it "Sac-aaS"? No.

Cloud security practical defenses

- Do all the normal defensive techniques we're learning

- Prevent cross-tenant data or access leakage:
  - Cloud providers: keep your hypervisors up to date, ensure correct settings, apply network isolation techniques (e.g. VLANs)
  - Customers: use reputable providers that do the above, ensure correct settings
- Prevent access rights issues:
  - Set your access rights as restrictively as possible from the *start*
  - Monitor access rights over time (there's software for this)
- Prevent cloud command-and-control issues:
  - Secure credentials
  - Set service usage notices and pay caps
- Mitigate the fact the cloud provider has access to all your data:
  - Don't use the cloud's *storage* services
  - Encrypt the data before it hits the cloud (if possible)
  - Don't use cloud at all...