



# **Cloud Systems Introduction**

(Mastering Cloud Computing: Chapter#1)

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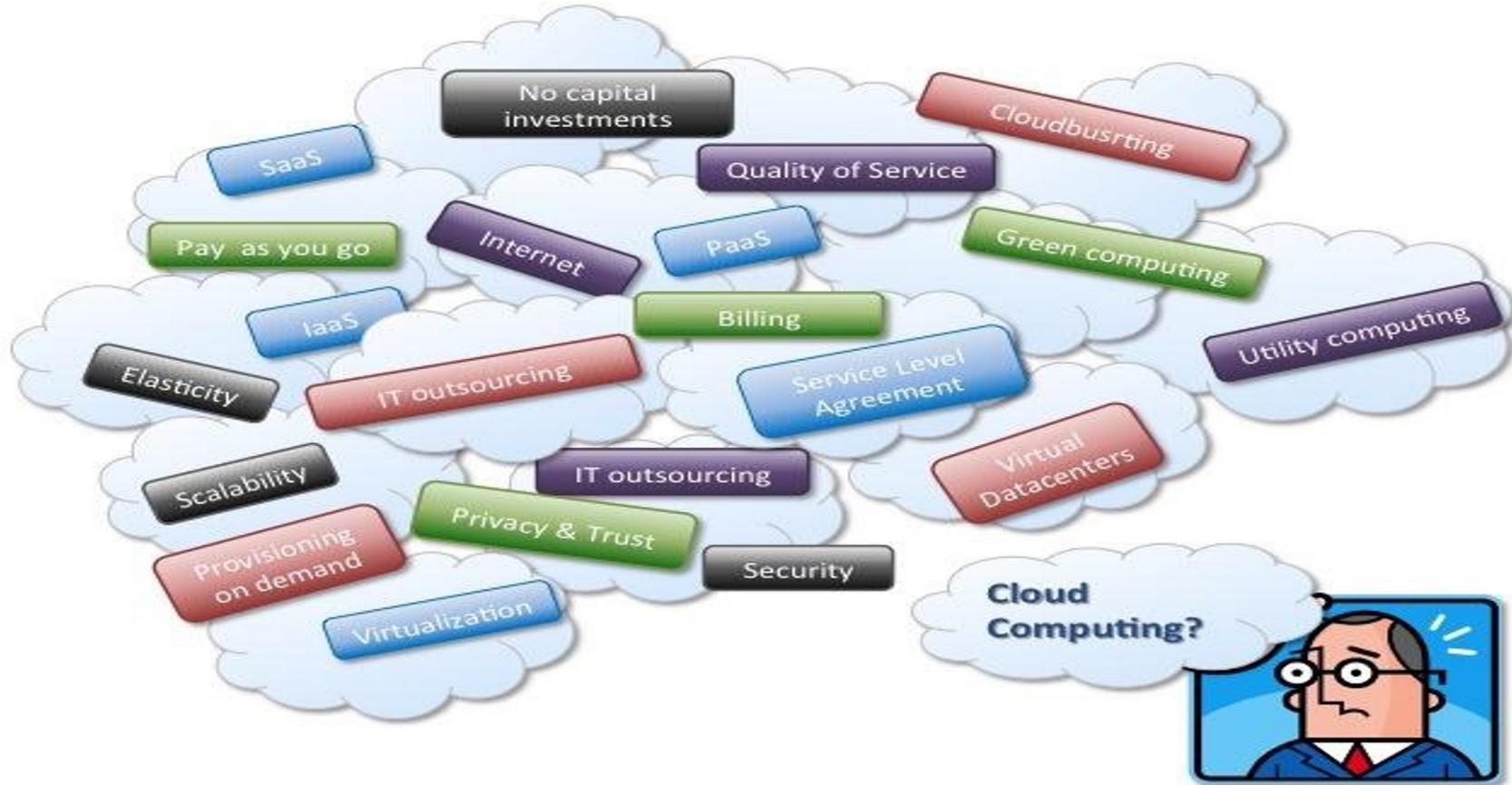
As of now, computer networks are still in their infancy, but as they grow up and become sophisticated, we will probably see the spread of 'computer utilities' which, like present electric telephone utilities, will service individual homes and offices across the country.

-Leonard Kleinrock, 1969, ARPANET

# The Vision...



# Defining Cloud Computing



# Huh?

- It's a Buzzword!
- Term for MANY ideas and concepts

## Armburst

- Cloud computing refers to both the applications delivered as services over the Internet and the hardware and software in the datacenters that provide those services.

## NIST (National Institute of Standards and Technologies)

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

## Forrester

- A standardized IT capability (services, software, or infrastructure) delivered via the Internet in a pay-per-use, self-service way

## Larry Ellison

- Water Vapor... [other than that] it is just a computer connected to a network!
- Changed its mind in 2015 ...

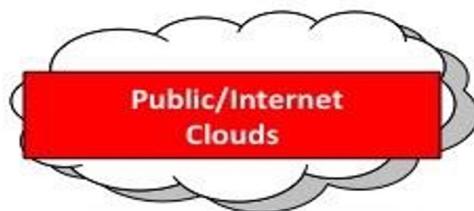
# Reese's Definition (as a utility)

- The service is accessible via a Web browser or a Web services application programming interface (API)
- Zero capital expenditure is necessary to get started.
- You pay only for what you use as you use it.

A **cloud** is a type of **parallel and distributed** system consisting of a collection of **interconnected and virtualized** computers that are dynamically provisioned and **presented as one or more unified computing resources** based on **service-level agreements** established through **negotiation** between the **service provider** and **consumers**.

# Existing Cloud

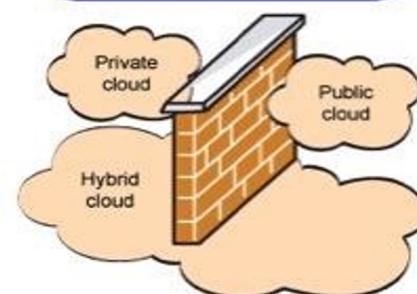
## Cloud Deployment Models



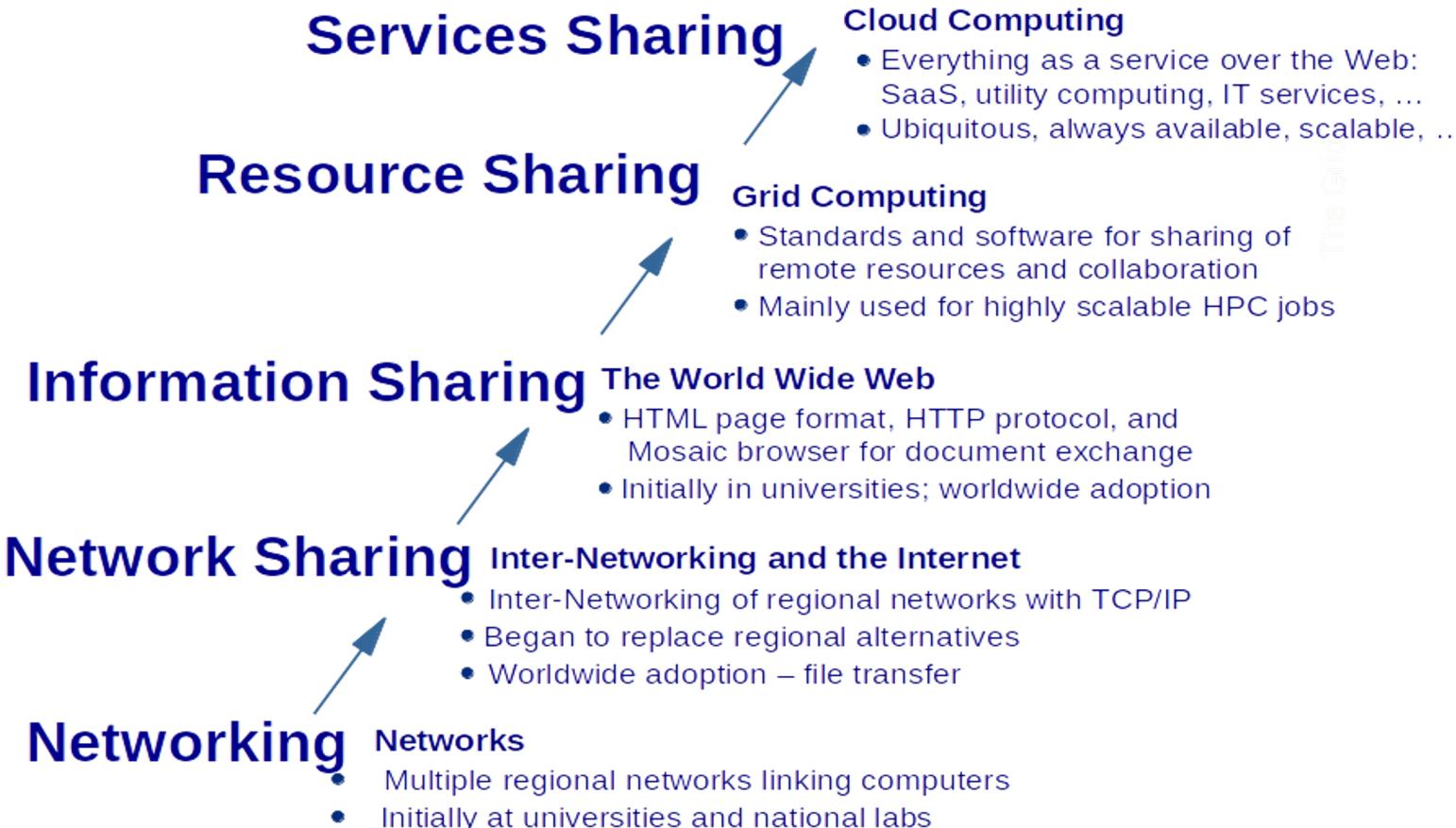
\* 3rd party,  
multi-tenant Cloud  
infrastructure  
& services:  
  
\* available on  
subscription basis to all.

\* A public Cloud model  
within a company's  
own Data Center /  
infrastructure for  
internal and/or  
partners use.

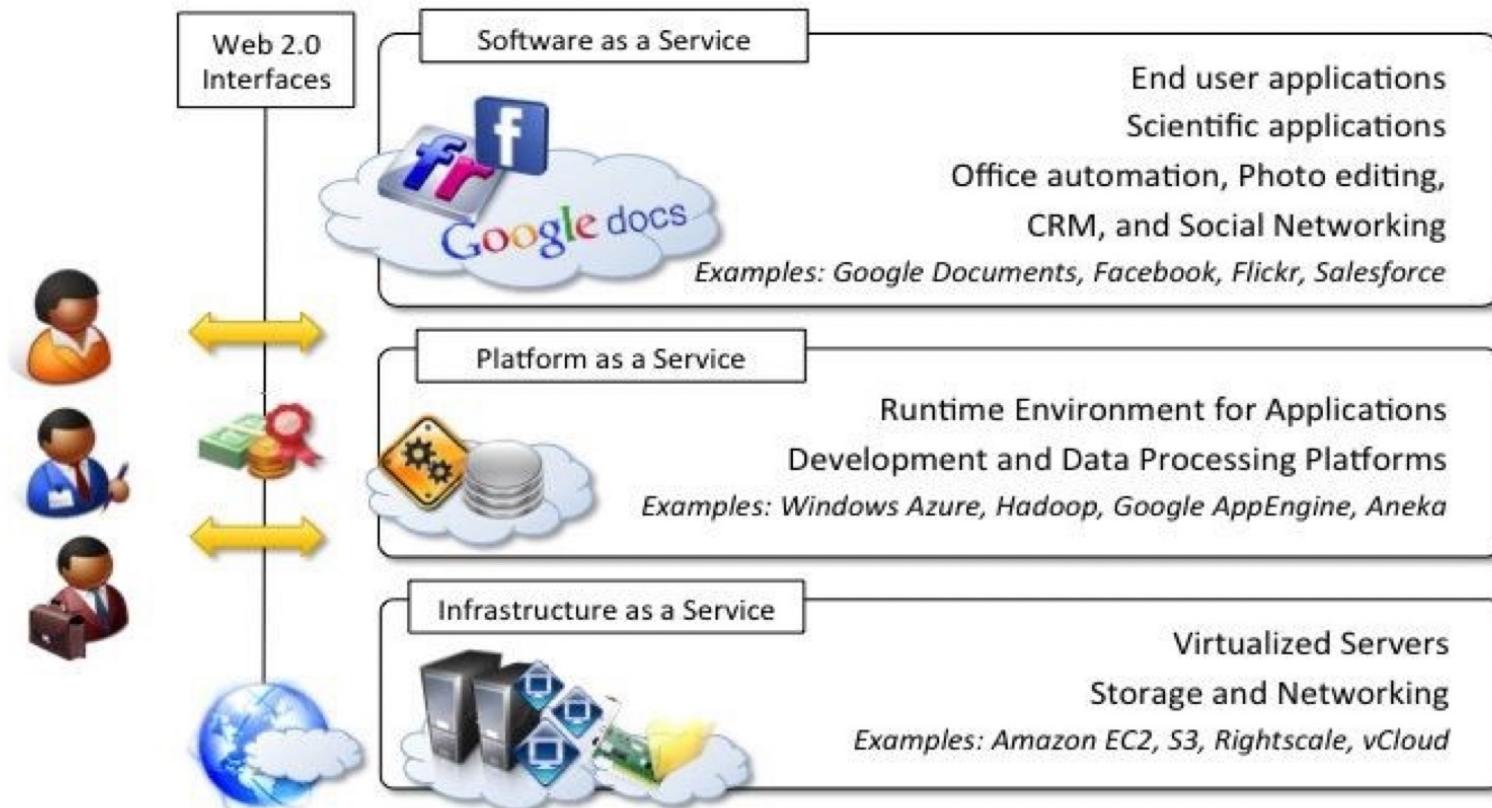
\* Mixed usage of  
private and public  
Clouds: Leasing public  
cloud services  
when private cloud  
capacity is  
insufficient



# Evolution of Sharing on the Internet



# Reference Model



# What is the evolution of the internet to 2020?

## A tidal wave of four internet growth stages.

The chart to the right depicts four stages of internet growth.

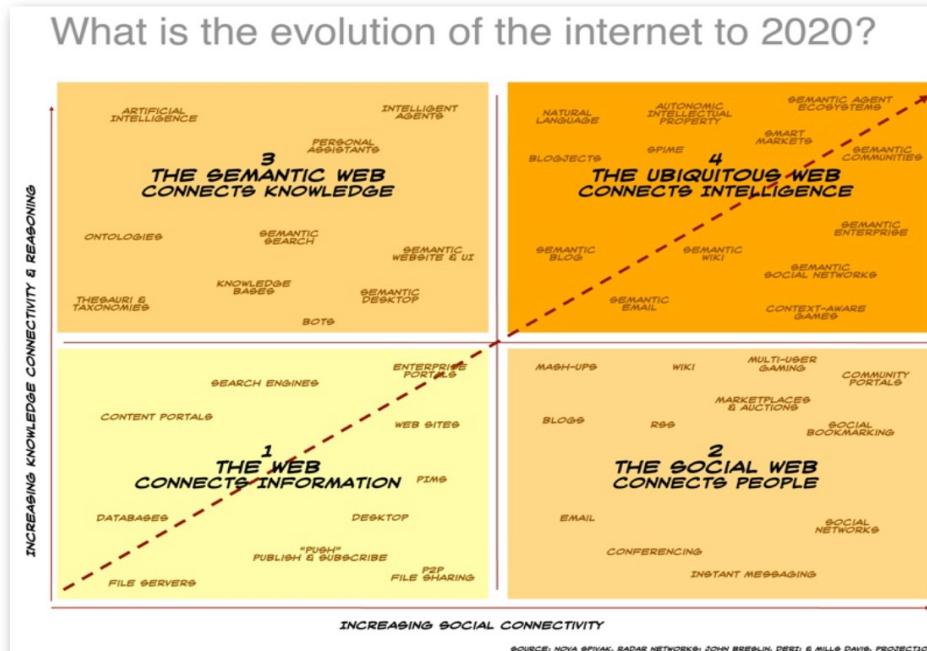
**Web 1.0**, was about connecting information and getting on the net.

**Web 2.0** is about connecting people — putting the “I” in user interface, and the “we” into webs of social participation.

**Web 3.0** is starting now. It’s about representing meanings, connecting knowledge, and putting these to work in ways that make our experience of internet more relevant, useful, and enjoyable.

**Web 4.0** will come later. It is about connecting intelligences in a ubiquitous web where both people and things reason and communicate together.

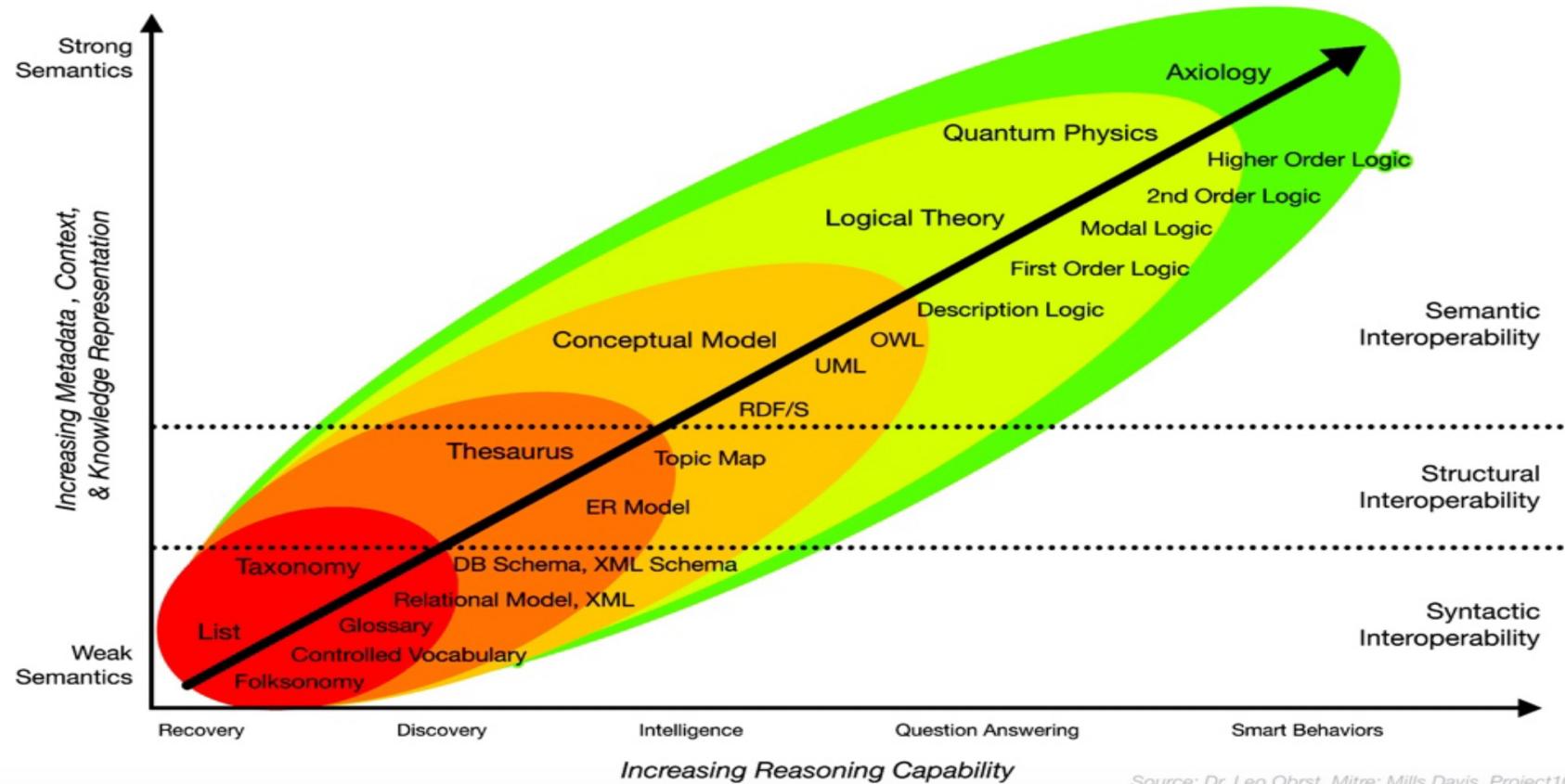
Over the next decade, semantic technologies will spawn multi-billion dollar technology markets that will drive trillion dollar global economic expansions to transform industries as well as our experience of the internet.



SOURCE: NOVA SPYAK, RADAR NETWORKS; JOHN BREHAN, DERRI & MILLS DAVIS, PROJECTIONX

# What is next generation semantic search?

Recovery, discovery, intelligence, question answering, & smart behaviors.



# Benefits to a regular business?

- No up-front commitments
- On-demand access
- Nice pricing (capital costs -> utility costs, no depreciation)
- Simplified app acceleration, scalability and elasticity
- Efficient resource allocation
- Energy efficiency??
- Seamless creation and use of third-party services

# Benefits for Software Company going to SaaS

- No deployment issues (CDs, downloads, etc)
- No need to support multiple OSs
- Faster to market
- A/B testing of features
- Efficiency and reliability now key
- More efficient developers, just try it!

# Storms may be on the horizon...

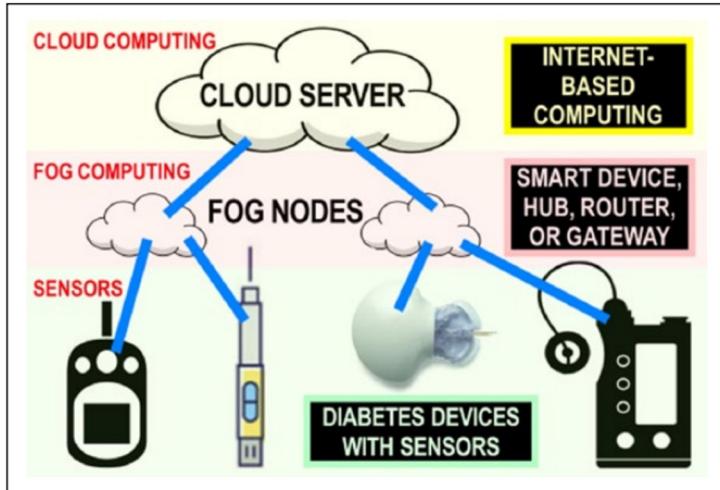
- Security
  - Confidentiality, Secrecy, Protection
- Legal
  - Google/Facebook privacy
  - Differing viewing laws
- Latency & Data Location (later)

# How did we get here?

## 5 core technologies:

1. Distributed Systems
2. Virtualization
3. Web 2.0
4. Service-oriented computing
5. Utility-oriented computing

# Emerging Cloud Trends



**Figure 1.** Hierarchy of sensors, fog computing, and cloud computing for wireless diabetes devices. This figure shows (1) diabetes devices with sensors, which include a blood glucose monitor, smart insulin pen, continuous glucose monitor, and insulin pump—and these last two devices operating together can constitute a closed-loop or artificial pancreas system (green background); (2) fog computing nodes, which include smart devices, hubs, routers, and gateways (pink background); and (3) cloud servers, which use Internet-based computing (yellow background)

1. Fog Computing & Edge Computing
2. Containerization
3. PaaS
4. Security Automation & Orchestration
5. Hybrid Wireless