Section 2: Week 5: Naming Schemes and Shared Memory

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# Naming Schemes and Shared Memory

“There are three hard things in computer science, naming things and being off-by-one.” The classical joke applies to the design of distributed systems, as a mechanism for naming nodes within the system needs to exist. Modern systems use Domain Naming Services (DNS) to create a hierarchial structure too the enterprise, other scenarios can use protocols such as NetBIOS, for simple flat identifier lists. Similar to other distributed system concepts, the decision between a list or tree comes down to the required scale and complexity. Consider a small branch office with a dozen computers and a shared printer, there having the user friendly name of *TedsLaptop* can efficiently rely on an *implicit contextual identification*. Then imagine a multinational corporation that has many Teds, and the need for an *explicit contextual identificaiton* is required. Fully Qualified Domain Names (FQDN), e.g., *tedslaptop.seattle.wa.sales.contoso.com*, gives system designers the ability to express these contexts, and convey that “*Ted is a member of the sales team in Seattle, Washington.*”

# Naming Structure for Contoso

Contoso is a highly globally distributed organization, with resources dedicated to corporate affairs, manufacturing, and retail outlets (see Figure 1). They require a naming structure that allows explicit contextual identification of a resource within this environment. They might choose a base naming convention, such as {city}.{country}.{department}.contoso.com. Within a physical location, a need exists to pull similar reasources into more fine granined pools. The Point of Sale devices at their store in Manhatten might become {device-id}.pos.nyc.us.retail.contoso.com.

Some of the services that are provided by Contoso are more global and can rely on implicit contextual naming. For instance, all employees need to authenticate against their local Directory Service endpoint. It would be confusing for these employees to remember this occurs on {node}.auth.{city}.{country}.ops.contoso.com versus the Cananocial Name (CNAME), auth.conotoso.com. As more traffic to services routes to CNAMEs, there is a virtualization of the addresses and an extension point to deliver more value to the caller. Consider a customer accessing multi-media content from the public website. If the Content Delivery Network (CDN) only streamed from New York, then users in Australia might complain about the latency. Instead, a Geo-Location Aware Edge can serve the requests, without coupling configuration into the website code. Amazon Web Services (AWS), a widely used public cloud platform, exposes these capabilities through their Route53 and CloudFront CDN offerings to efficiently and economically enable businesses of all sizes leverage these scenarios.

# Memory Management Models

Three common strategies for allocating an address space are single continuous allocation, partitioned allocation, and segmented allocation.

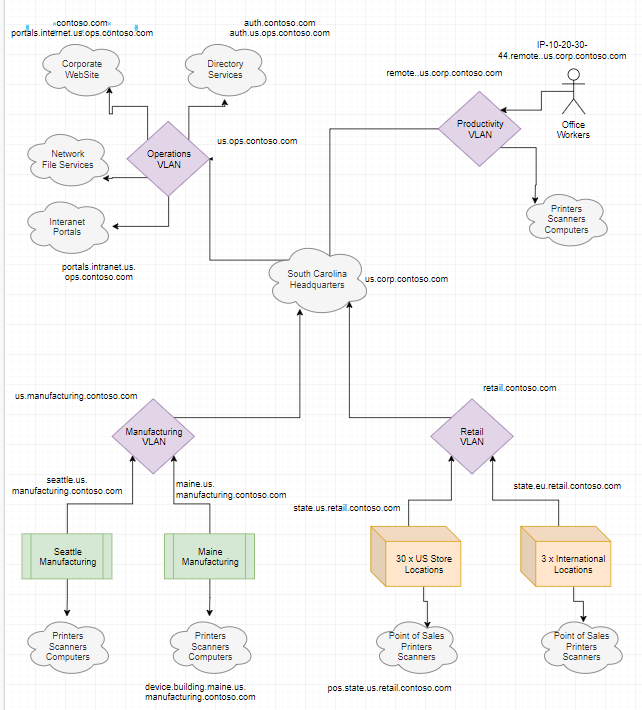


Figure 1: Naming Hierarchy