Building Modern Web Applications

Evan Roth
Affinity Director
Software Architecture
Productive Edge

Productive Edge At-a-Glance

2008

Founded as a software engineering firm focused on Web application development with agile processes and open source technologies

"Enterprise Boutique"

Built on quality and personal touchtechnologies

Office in 4 contries

Headquarters in Chicago

150+ resources

45% onshore

80% employees

55% offshore

20% contractors

2013/2014

Service offerings now span:

- WEB
- MOBILE
- DIGITAL
- MANAGED

What we do

We provide end-to-end, full stack, high quality web and mobile solutions.

end-to-end

strategy, visual design, user experience, business analysis, development, testing, analytics, support

solutions

business outcomes realized & measured

full stack

front end, back end, web, mobile, integration, data

high quality

user validated, thoroughly tested

Brief History of the Evolution of Apps

Pre 1990's

1990's

Shared systems

Console-based Applications

In-house infrastructure

Birth of the internet

Brief History of the Evolution of Apps

Pre 1990's

1990's

2000's

Client-Server Apps

CSS allows for quick improvements beyond simple text

Enterprise embraces frameworks: Java & Microsoft's ASP

Brief History of the Evolution of Apps

PHP released-now 80%
of web sites run it

Co-location facilities

AJAX allows for building
rich web applications

Browsers become the
de facto client

Bring on the Javascript
frameworks

Browsing on phones
becomes commonplace

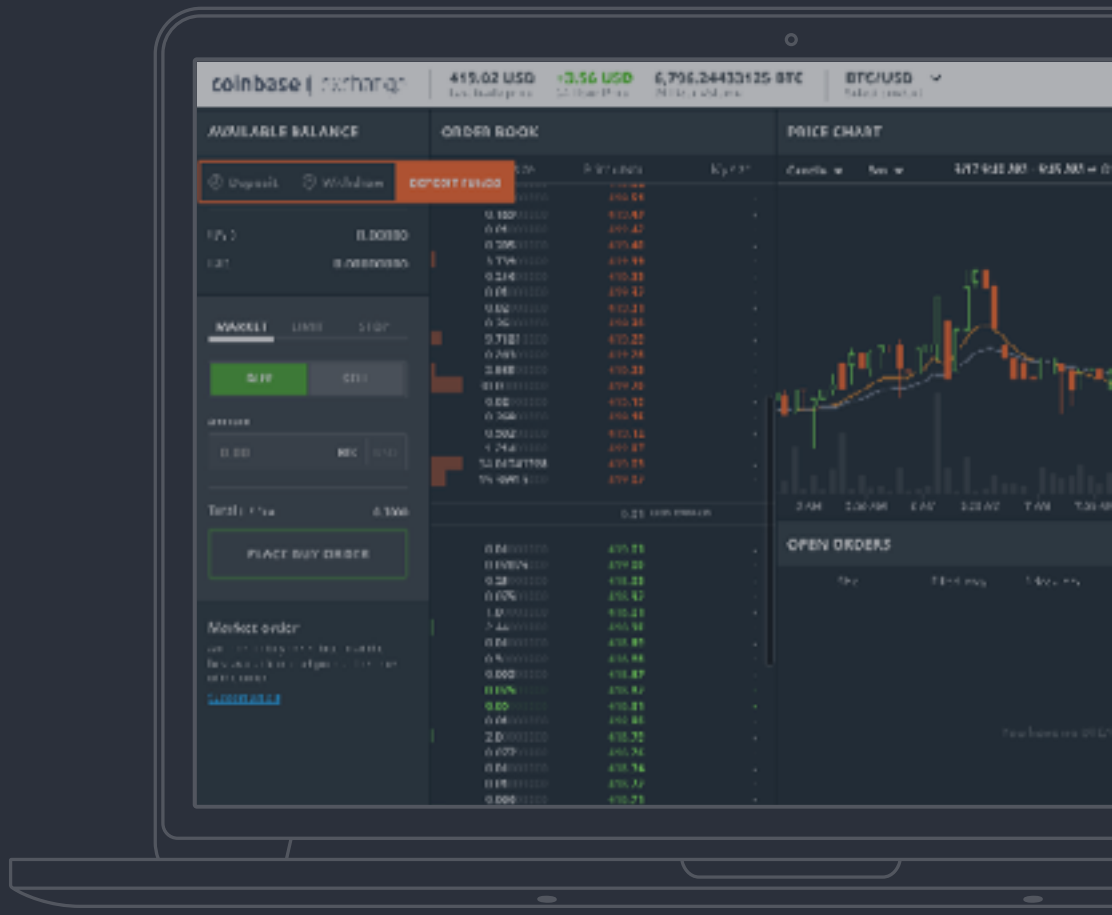
Brief History of the Evolution of Apps

NOW

Modern development
requires modern processes

Focus on performance
and quality

Applications require
a mixed skillset



Development Processes

Waterfall

Requirements up front

Rigid budget and timeline

Project phases for Development and testing

Agile

Embrace change

Iterative development

Continuous delivery

Hybrid –
Practical Agile

Productive Edge's
model for working with
our clients

Early Discovery phase to
understand requirements

Early technical spikes
to mitigate risk

Established deadline and budget
Iterative development

Continuous delivery

Continuous Delivery

Working towards:

- Reacting faster
- Reducing risk & cost
- Flexible releases

Separate environments

- Test
- Staging
- Production

Automated builds

- Test builds triggered by code check-ins
- Contain automated quality gates
  - Build success
  - Unit tests Code that tests other code
  - Other rules available

Cloud Services

Infrastructure-as-a-Service

- Servers
- Databases
- Caches
- Specific services
  - Notifications such as Email or mobile messaging
  - Message Queueing

Usable On-Demand

- Scriptable, burstable configuration
- Redundancy
- Geographical shortest hop
- Leading providers
  - Amazon Web Services
  - Microsoft Azure
  - OpenStack - RackSpace / NASA project open-sourced with wide support

Anatomy of a Simple Application

Server “Back End”

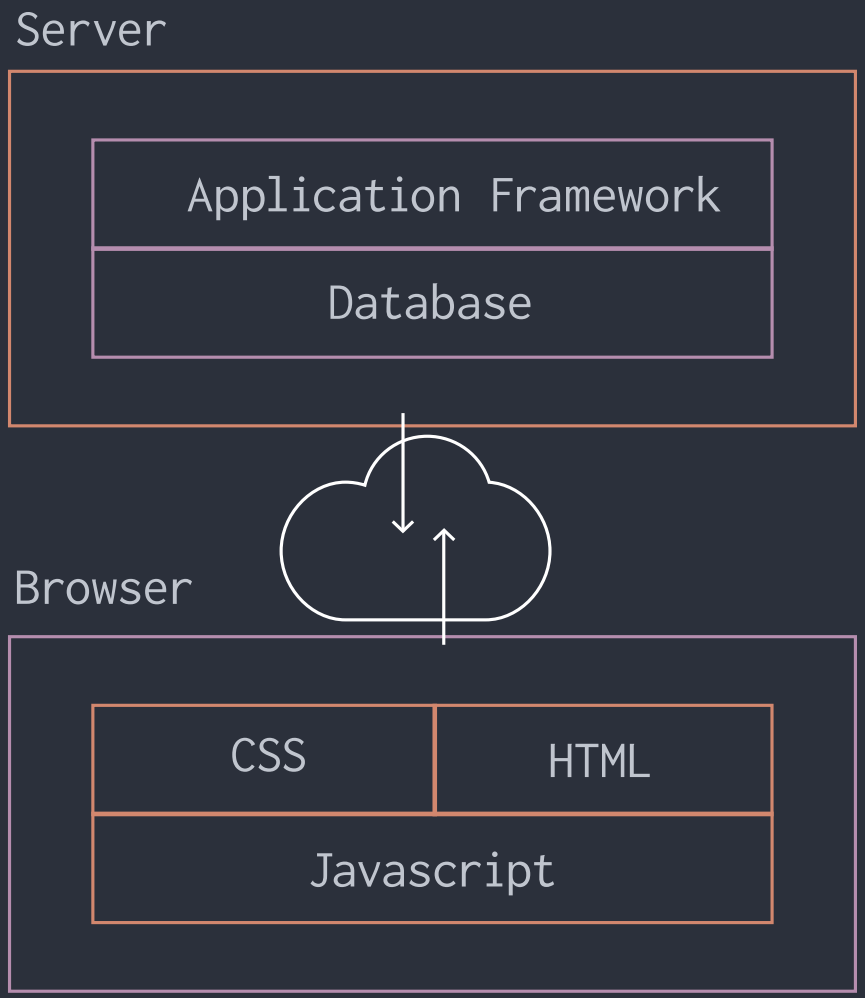
Computation

Persistence

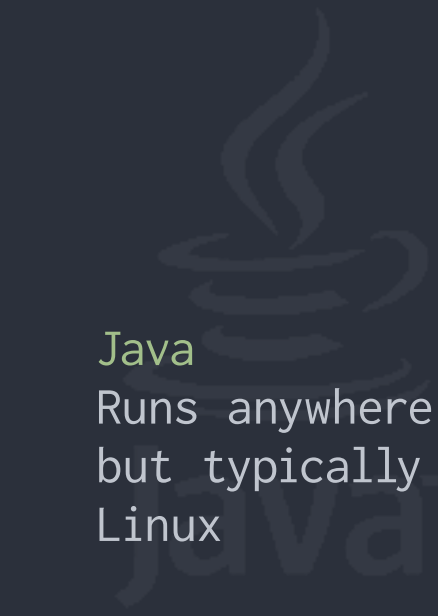
Browser “Front End”

Rendering

Interaction



Common Back-End Frameworks



Java
Runs anywhere, but typically Linux

Microsoft .Net
Windows-based
ASP.NET MVC widely popular

PHP
Commonly with the LAMP stack (Linux, Apache, MySQL & PHP)
All open source
Huge adaptation

Service-based Architecture

Applications become a mash-up of multiple services

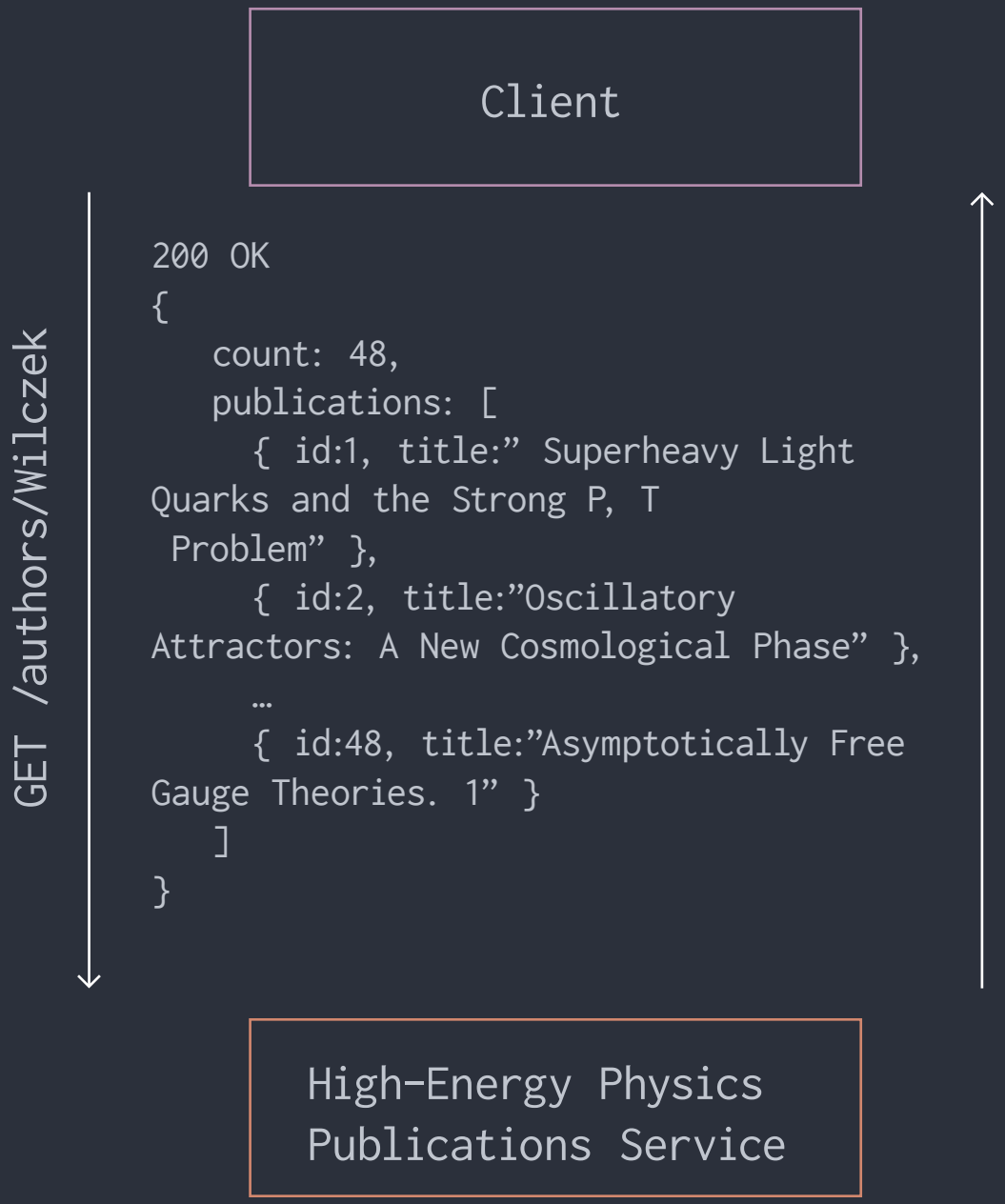
- Enable multiple clients, whether web or mobile

Microservice

- Independently deployable applications
- Focus on specific domain

Services focus on RESTful design

- Representational State Transfer the architecture of the web
- Semantic use of endpoints


Client
GET /authors/Wilczek
200 OK
{
count: 48,
publications: [
{ id:1, title:” Superheavy Light Quarks and the Strong P, T Problem” },
{ id:2, title:”Oscillatory Attractors: A New Cosmological Phase” },
…
{ id:48, title:”Asymptotically Free Gauge Theories. 1” }
]
}
High-Energy Physics Publications Service

What's a Database Today?

Relational most common understanding, row oriented

- Ex: MySql or SQL Server

"NoSQL" various non-relational databases that solve certain problems well

- Document - most common NoSQL, store objects as documents [MongoDB]
- Column - highly efficient aggregation of data (ex: avg height of users) [Cassandra]
- Graph - Nodes with relationships [Neo4J]
  - Solves problem queries like "Show me pizza restaurants in Chicago that my friends like"
- Key-Value store - Highly efficient retrieval of objects by key [memcached]

Search

Providing near real-time results

Solve problems where databases struggle:

- Geospatial searching
- Faceting
- Spellcheck

Lucene

- Java-based indexing of documents

Apache Solr & Elasticsearch

- Lucene-based search engines
- Offer updated integration and ease of use
- Cutting-edge scalability
- Elasticsearch completely controlled by modern service

Javascript: Language of the Web

jQuery

- Cross-platform library for manipulating a web page
- Most popular Javascript library by a wide margin
- Included in many frameworks and platforms

Backbone.js

- Lightweight templating engine for binding data models to HTML

AngularJS

- Web application framework for single page applications
- Enables two-way data-binding between HTML and back-end services

React

- Latest framework gaining popularity
- Renderings beyond HTML allow for HTML5 elements and

Simplifying Design Execution

Frameworks for streamlining HTML, CSS and JS components

Most popular:
Bootstrap & Foundation

Responsive
Grid system
Stylized, themeable
CSS components
Optional Javascript extensions
Ex: Pop-up modal or fixed sidebar

Javascript from Front to Back

Node.js

Runtime environment for writing Javascript applications

Fast execution using Google V8 engine

Enables full-stack development in Javascript

Built in package manager

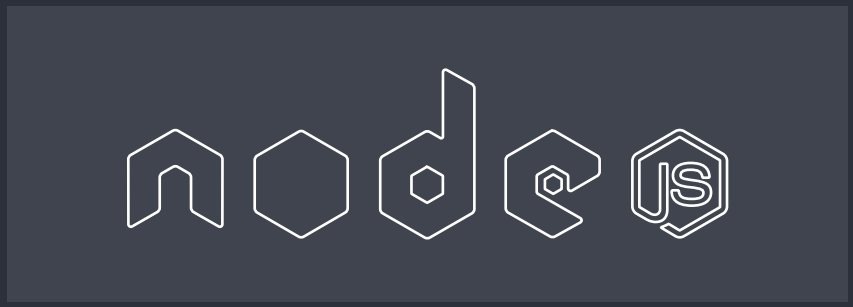
MEAN stack

Trending Javascript-based development stack

Compare to LAMP stack

Client

Server



Database

Caching

Client-side cache

- Browser does not request resource from server
- Commonly used for static resources

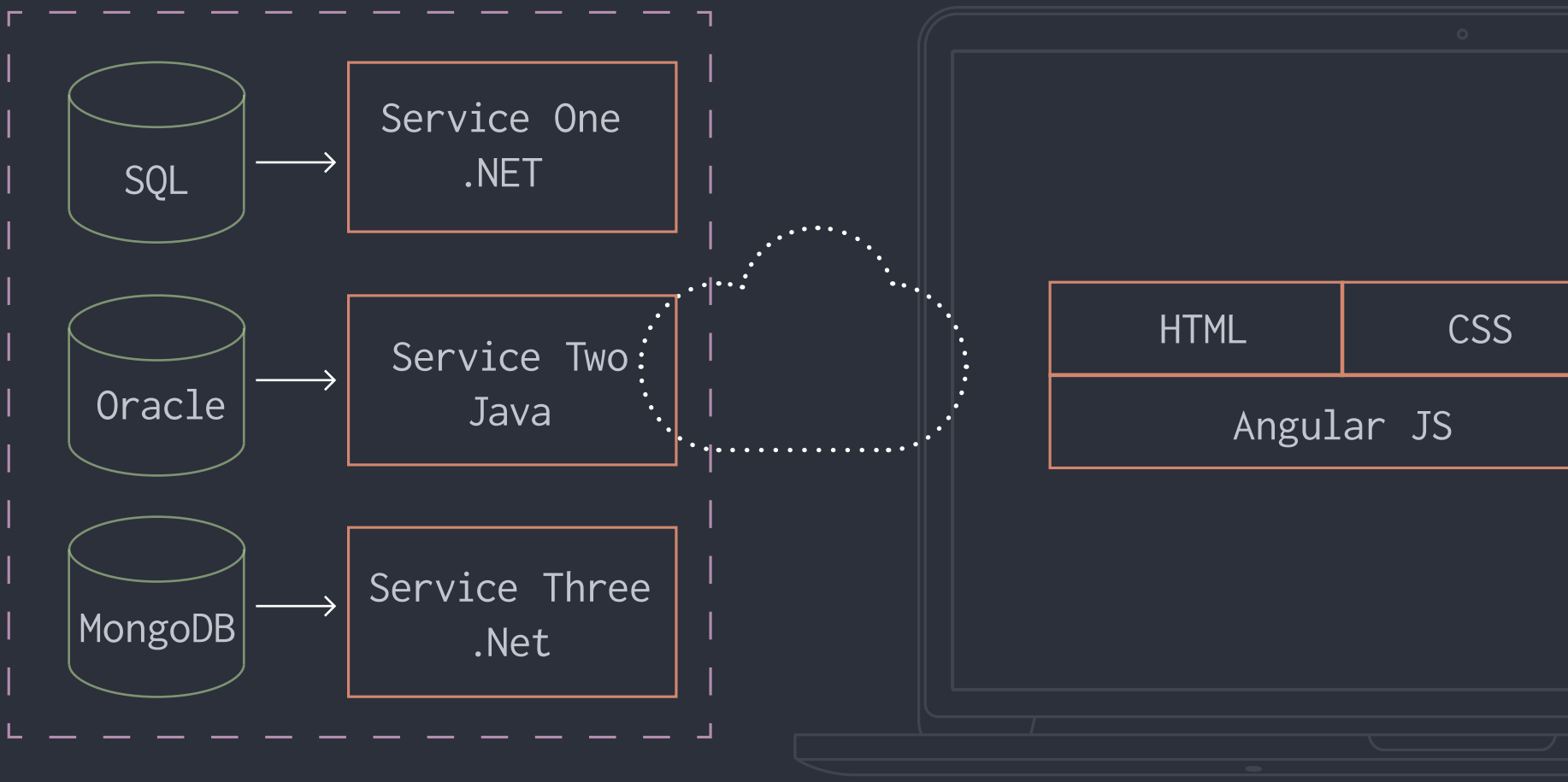
Server-side cache

- Web server caches outgoing requests
- Does not re-process upon further request

Distributed application caches

- Distributed cache consists of multiple nodes across infrastructure
- Eliminate redundant calls to long running processes
  - Database queries
  - Intense calculations
- Typically NoSql Key-Value store
- Various patterns for loading data into the cache

The Result

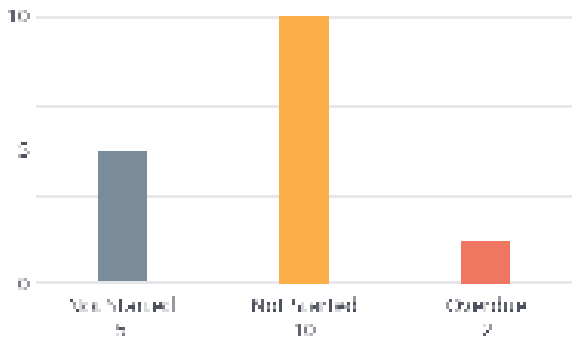

SQL
Service One
.NET
Oracle
Service Two
Java
MongoDB
Service Three
.Net
HTML
CSS
Angular JS

WELCOME, ALICE

Insights Dashboard

EDIT LAYOUT NEW WIDGET

My Work Status (Due This Week)



My District's Execution Performance

Location	% Complete	%Overdue	#Overdue
1000	75%	80%	4
1001	71%	81%	3
1002	79%	90%	2
1003	85%	63%	5
1004	84%	53%	12
1005	71%	91%	3
TOTAL DISTRICTS: 500	71%	91%	3

My District's High Priority Projects

Projects	Due	%Comp
Operations & Management Manual - Not...	7/28	55%
Delight the Customer Weekly Huddle	7/28	74%
PCard / T&E Card Survey	8/1	56%
Please Share Feedback on Supply Logisti...	8/1	44%
Delight the Customer Weekly Huddle	8/2	33%
RN and Field Label Orders	8/3	30%

1–6 of 10 1 2

My District's Historical Execution Performance (Last 6 Weeks)

Location	This Week	Last Week	7/5/15	6/28/15	6/21/15	6/14/15
1000	75%	80%	95%	98%	100%	100%
1001	75%	80%	95%	98%	100%	100%
1002	75%	80%	95%	98%	100%	100%
1003	75%	80%	95%	98%	100%	100%
1004	75%	80%	95%	98%	100%	100%
1005	75%	80%	95%	98%	100%	100%
TOTAL DISTRICTS: 500	75%	80%	95%	98%	100%	100%

Project Mix by Department (This Week)