



WIZELINE
ACADEMY

UPCOMING COURSES

NODE.JS WORKSHOP

September 21 @CDMX, Livestreamed

TECH TALK SERIES: AN INTRO TO VAULT

September 27 @CDMX, Livestreamed

MICROSERVICES WITH GOLANG WORKSHOP

September 28 @GDL, Livestreamed

PROBLEM SOLVING & ALGORITHMS CRASH COURSE

Sept. 30-Oct. 1 @GDL

VUE.JS WORKSHOP

October 7 @GDL, Livestreamed



@WizelineAcademy



/WizelineAcademy



academy.wizeline.com



Get notified about courses:
tinyurl.com/WL-academy



Introduction to Protobuf: An extensible mechanism for serializing structured data

WIZELINE®



Agenda

- Context
- What is Protobuf
- Companies using it
- How it works
- Installation
- Swift Protobuf
- Demo





Context



Web Service

- **Service** offered by an electronic device to another electronic device
- Communicate via World Wide Web
- Originally designed for human-to-machine communication
- Transfer machine readable file formats such as XML and JSON





- ```

1 #!/usr/bin/perl -w
2
3 #
4 # Copyright (c) 2015-2016, Microsoft Corporation
5 #
6 # All rights reserved.
7 #
8 # Redistribution and use in source and binary forms, with or without
9 # modification, are permitted provided that the following conditions are met:
10 #
11 # 1. Redistributions of source code must retain the above copyright notice,
12 # this list of conditions and the following disclaimer.
13 #
14 # 2. Redistributions in binary form must reproduce the above copyright notice,
15 # this list of conditions and the following disclaimer in the documentation
16 # and/or other materials provided with the distribution.
17 #
18 # THIS SOFTWARE IS PROVIDED BY MICROSOFT CORPORATION "AS IS" AND ANY
19 # EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
20 # IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
21 # PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL MICROSOFT CORPORATION BE
22 # LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR
23 # CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF
24 # SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR
25 # BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY,
26 # WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR
27 # OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF
28 # ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
29 #
30 #
31 #
32 #
33 #
34 #
35 #
36 #
37 #
38 #
39 #
40 #
41 #
42 #
43 #
44 #
45 #
46 #
47 #
48 #
49 #
50 #
51 #
52 #
53 #
54 #
55 #
56 #
57 #
58 #
59 #
60 #
61 #
62 #
63 #
64 #
65 #
66 #
67 #
68 #
69 #
70 #
71 #
72 #
73 #
74 #
75 #
76 #
77 #
78 #
79 #
80 #
81 #
82 #
83 #
84 #
85 #
86 #
87 #
88 #
89 #
90 #
91 #
92 #
93 #
94 #
95 #
96 #
97 #
98 #
99 #
100 #
101 #
102 #
103 #
104 #
105 #
106 #
107 #
108 #
109 #
110 #
111 #
112 #
113 #
114 #
115 #
116 #
117 #
118 #
119 #
120 #
121 #
122 #
123 #
124 #
125 #
126 #
127 #
128 #
129 #
130 #
131 #
132 #
133 #
134 #
135 #
136 #
137 #
138 #
139 #
140 #
141 #
142 #
143 #
144 #
145 #
146 #
147 #
148 #
149 #
150 #
151 #
152 #
153 #
154 #
155 #
156 #
157 #
158 #
159 #
160 #
161 #
162 #
163 #
164 #
165 #
166 #
167 #
168 #
169 #
170 #
171 #
172 #
173 #
174 #
175 #
176 #
177 #
178 #
179 #
180 #
181 #
182 #
183 #
184 #
185 #
186 #
187 #
188 #
189 #
190 #
191 #
192 #
193 #
194 #
195 #
196 #
197 #
198 #
199 #
200 #
201 #
202 #
203 #
204 #
205 #
206 #
207 #
208 #
209 #
210 #
211 #
212 #
213 #
214 #
215 #
216 #
217 #
218 #
219 #
220 #
221 #
222 #
223 #
224 #
225 #
226 #
227 #
228 #
229 #
230 #
231 #
232 #
233 #
234 #
235 #
236 #
237 #
238 #
239 #
240 #
241 #
242 #
243 #
244 #
245 #
246 #
247 #
248 #
249 #
250 #
251 #
252 #
253 #
254 #
255 #
256 #
257 #
258 #
259 #
260 #
261 #
262 #
263 #
264 #
265 #
266 #
267 #
268 #
269 #
270 #
271 #
272 #
273 #
274 #
275 #
276 #
277 #
278 #
279 #
280 #
281 #
282 #
283 #
284 #
285 #
286 #
287 #
288 #
289 #
290 #
291 #
292 #
293 #
294 #
295 #
296 #
297 #
298 #
299 #
300 #
301 #
302 #
303 #
304 #
305 #
306 #
307 #
308 #
309 #
310 #
311 #
312 #
313 #
314 #
315 #
316 #
317 #
318 #
319 #
320 #
321 #
322 #
323 #
324 #
325 #
326 #
327 #
328 #
329 #
330 #
331 #
332 #
333 #
334 #
335 #
336 #
337 #
338 #
339 #
340 #
341 #
342 #
343 #
344 #
345 #
346 #
347 #
348 #
349 #
350 #
351 #
352 #
353 #
354 #
355 #
356 #
357 #
358 #
359 #
360 #
361 #
362 #
363 #
364 #
365 #
366 #
367 #
368 #
369 #
370 #
371 #
372 #
373 #
374 #
375 #
376 #
377 #
378 #
379 #
380 #
381 #
382 #
383 #
384 #
385 #
386 #
387 #
388 #
389 #
390 #
391 #
392 #
393 #
394 #
395 #
396 #
397 #
398 #
399 #
400 #
401 #
402 #
403 #
404 #
405 #
406 #
407 #
408 #
409 #
410 #
411 #
412 #
413 #
414 #
415 #
416 #
417 #
418 #
419 #
420 #
421 #
422 #
423 #
424 #
425 #
426 #
427 #
428 #
429 #
430 #
431 #
432 #
433 #
434 #
435 #
436 #
437 #
438 #
439 #
440 #
441 #
442 #
443 #
444 #
445 #
446 #
447 #
448 #
449 #
450 #
451 #
452 #
453 #
454 #
455 #
456 #
457 #
458 #
459 #
460 #
461 #
462 #
463 #
464 #
465 #
466 #
467 #
468 #
469 #
470 #
471 #
472 #
473 #
474 #
475 #
476 #
477 #
478 #
479 #
480 #
481 #
482 #
483 #
484 #
485 #
486 #
487 #
488 #
489 #
490 #
491 #
492 #
493 #
494 #
495 #
496 #
497 #
498 #
499 #
500 #
501 #
502 #
503 #
504 #
505 #
506 #
507 #
508 #
509 #
510 #
511 #
512 #
513 #
514 #
515 #
516 #
517 #
518 #
519 #
520 #
521 #
522 #
523 #
524 #
525 #
526 #
527 #
528 #
529 #
530 #
531 #
532 #
533 #
534 #
535 #
536 #
537 #
538 #
539 #
540 #
541 #
542 #
543 #
544 #
545 #
546 #
547 #
548 #
549 #
550 #
551 #
552 #
553 #
554 #
555 #
556 #
557 #
558 #
559 #
560 #
561 #
562 #
563 #
564 #
565 #
566 #
567 #
568 #
569 #
570 #
571 #
572 #
573 #
574 #
575 #
576 #
577 #
578 #
579 #
580 #
581 #
582 #
583 #
584 #
585 #
586 #
587 #
588 #
589 #
590 #
591 #
592 #
593 #
594 #
595 #
596 #
597 #
598 #
599 #
600 #
601 #
602 #
603 #
604 #
605 #
606 #
607 #
608 #
609 #
610 #
611 #
612 #
613 #
614 #
615 #
616 #
617 #
618 #
619 #
620 #
621 #
622 #
623 #
624 #
625 #
626 #
627 #
628 #
629 #
630 #
631 #
632 #
633 #
634 #
635 #
636 #
637 #
638 #
639 #
640 #
641 #
642 #
643 #
644 #
645 #
646 #
647 #
648 #
649 #
650 #
651 #
652 #
653 #
654 #
655 #
656 #
657 #
658 #
659 #
660 #
661 #
662 #
663 #
664 #
665 #
666 #
667 #
668 #
669 #
670 #
671 #
672 #
673 #
674 #
675 #
676 #
677 #
678 #
679 #
680 #
681 #
682 #
683 #
684 #
685 #
686 #
687 #
688 #
689 #
690 #
691 #
692 #
693 #
694 #
695 #
696 #
697 #
698 #
699 #
700 #
701 #
702 #
703 #
704 #
705 #
706 #
707 #
708 #
709 #
710 #
711 #
712 #
713 #
714 #
715 #
716 #
717 #
718 #
719 #
720 #
721 #
722 #
723 #
724 #
725 #
726 #
727 #
728 #
729 #
730 #
731 #
732 #
733 #
734 #
735 #
736 #
737 #
738 #
739 #
740 #
741 #
742 #
743 #
744 #
745 #
746 #
747 #
748 #
749 #
750 #
751 #
752 #
753 #
754 #
755 #
756 #
757 #
758 #
759 #
760 #
761 #
762 #
763 #
764 #
765 #
766 #
767 #
768 #
769 #
770 #
771 #
772 #
773 #
774 #
775 #
776 #
777 #
778 #
779 #
780 #
781 #
782 #
783 #
784 #
785 #
786 #
787 #
788 #
789
```



# JSON

- JavaScript Object Notation
- Lightweight data-interchange format
- Easy for humans to read and write
- ECMA-262 3rd Edition - December 1999
- Language independent

```
 "address": "400 Waterfront Dr E\\nHomestead\\nHomestead",
 "city": "Homestead",
 "review_count": 5,
 "name": "McDonald's",
 "neighborhoods": [
 "Homestead"
],
 "longitude": -79.910032,
 "state": "PA",
 "stars": 2,
 "latitude": 40.412086,
 "attributes": {
 "Take-out": true,
 "Wi-Fi": "free",
 "Drive-Thru": true,
 "Good For": {
 "dessert": false,
 "latenight": false,
 "ch": false,
 "ch": false,
 "ch": false
 }
 }
 },
 {
 "address": "400 Waterfront Dr E\\nHomestead\\nHomestead",
 "city": "Homestead",
 "review_count": 5,
 "name": "McDonald's",
 "neighborhoods": [
 "Homestead"
],
 "longitude": -79.910032,
 "state": "PA",
 "stars": 2,
 "latitude": 40.412086,
 "attributes": {
 "Take-out": true,
 "Wi-Fi": "free",
 "Drive-Thru": true,
 "Good For": {
 "dessert": false,
 "latenight": false,
 "ch": false,
 "ch": false,
 "ch": false
 }
 }
 }
]
```



## JSON

### Pro:

- Simple syntax, which results in less "markup" overhead compared to XML.
- Easy to use with JavaScript as the markup is a subset of JS object literal notation and has the same basic data types as JavaScript.
- [JSON Schema](#) for description and datatype and structure validation
- JsonPath for extracting information in deeply nested structures

### Con:

- Simple syntax, only a handful of different data types are supported.

## XML

### Pro:

- Generalized markup; it is possible to create "dialects" for any kind of purpose
- [XML Schema](#) for datatype, structure validation. Makes it also possible to create new datatypes
- [XSLT](#) for transformation into different output formats
- [XPath/XQuery](#) for extracting information in deeply nested structures
- built in support for namespaces

### Con:

- Relatively wordy compared to JSON (results in more data for the same amount of information).





# What is Protobuf?



# Protocol Buffer

- Method of serializing structured data
- Stream of bytes that represents the structured data
- 2001 Google internal - 2008 Public version
- Protocol buffers are a flexible, efficient, automated mechanism for serializing structured data
- You define how you want your data to be structured once (Proto)

0a 0d 08 f9 27 12 02 4f 4b 18 8a 8c 06 20 4e

<https://developers.google.com/protocol-buffers/docs/encoding>



# Companies Using it


Protocol buffers are now Google's *lingua franca* for data – at time of writing, there are 48,162 different message types defined in the Google code tree across 12,183 .proto files. They're used both in RPC systems and for persistent storage of data in a variety of storage systems.

<https://developers.google.com/protocol-buffers/docs/overview>

- [Google](#)
- [Twitter](#)
- [Apache Mesos](#)
- Netty
- [Open StreetMap](#)
- UbuntuOne
- Instagram before React





 **XML.txt** 3 KB  
Modified: Today, 3:36 PM


Add Tags...

▼ General:

Kind: Plain Text Document  
**Size: 3,485 bytes** (4 KB on disk)  
Where: iCloud Drive • Desktop  
Created: Today, 3:36 PM  
Modified: Today, 3:36 PM  
☐ Stationery pad  
☐ Locked

```
<0>
 <first_name>Darrell</first_name>
 <last_name>Kruise</last_name>
 <address></address>
 <phone_numbers>
 <type>LANDLINE</type>

 <number>(540)3542911</number>
 </phone_numbers>
</0>
```


 **JSON.txt** 2 KB  
Modified: Today, 12:35 PM

Add Tags...

▼ General:

Kind: Plain Text Document  
**Size: 2,497 bytes** (4 KB on disk)  
Where: iCloud Drive • Desktop  
Created: Today, 12:35 PM  
Modified: Today, 12:35 PM  
☐ Stationery pad  
☐ Locked

```
{"first_name": "Darrell", "last_name":
"Kruise", "address": {"address_lines":
[]}, "phone_numbers": [{"type":
"LANDLINE", "number":
"(540)354-2911"}]}
```

 **Protobuf.txt** 783 bytes  
Modified: Today, 12:36 PM

Add Tags...

▼ General:

Kind: Plain Text Document  
**Size: 783 bytes** (4 KB on disk)  
Where: iCloud Drive • Desktop  
Created: Today, 12:24 PM  
Modified: Today, 12:36 PM  
☐ Stationery pad  
☐ Locked

```
25 0d 0a 44 61 72 72 65 6c 6c 4b 72
75 73 65 22 0d 0a 28 35 34 30 29 33
35 34 2d 32 39 31 31 0d 0a 47 69 75
73 65 70 70 65 48 75 74 63 68 69 6e
73 0d 0a 30
```





How does it work?





# .Proto file

```
syntax = "proto2";

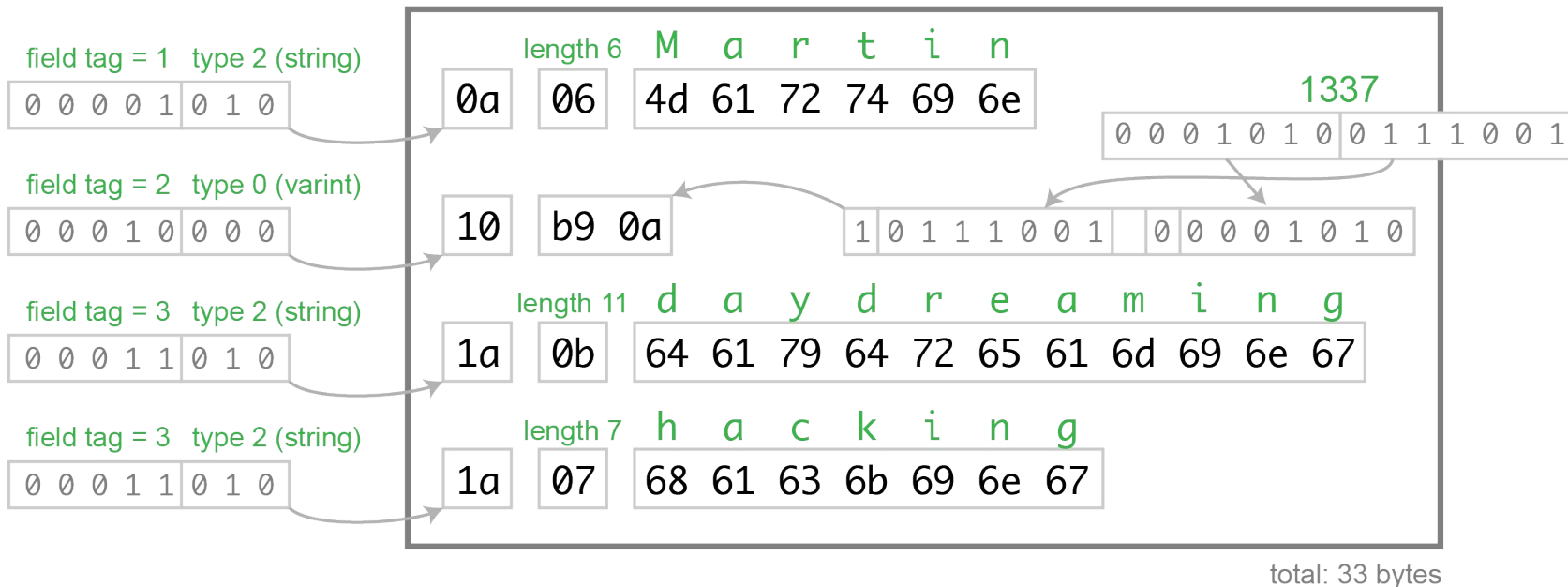
message AddressBook {
 repeated Contact contacts = 1;
};

message Address {
 repeated string address_lines = 1;
 optional string postcode = 2;
};

message Contact {
 required string first_name = 1;
 required string last_name = 2;
 optional Address address = 3;
 repeated Phone phone_numbers = 4;
};
```



## Protocol Buffers





# Setup



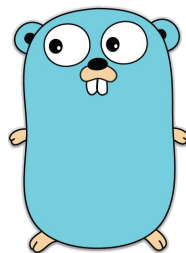
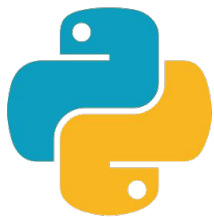
# Requirements

- autoconf
- automake
- libtool
- curl (used to download gmock)
- make
- g++
- Unzip
- xcode-select

<https://github.com/google/protobuf/blob/master/src/README.md>



## Language support







# Swift protobuf





# Swift Protobuf

*<https://github.com/apple/swift-protobuf>*

This project provides both the command-line program that adds Swift code generation to Google's protoc and the runtime library that is necessary for using the generated code. After using the protoc plugin to generate Swift code from your .proto files, you will need to add this library to your project.



`protoc --swift_out=. User.proto`





Demo Time 



<https://goo.gl/W6PZS7>





## *More resources*

<http://bit.ly/protoRef>

<https://github.com/google/protobuf>

<http://thrift.apache.org>

<https://grpc.io>

<https://github.com/apple/swift-protobuf>





THANK  
YOU

WIZELINE®







**WIZELINE**  
ACADEMY

## UPCOMING COURSES

### **NODE.JS WORKSHOP**

September 21 @CDMX, Livestreamed

### **TECH TALK SERIES: AN INTRO TO VAULT**

September 27 @CDMX, Livestreamed

### **MICROSERVICES WITH GOLANG WORKSHOP**

September 28 @GDL, Livestreamed

### **PROBLEM SOLVING & ALGORITHMS CRASH COURSE**

Sept. 30-Oct. 1 @GDL

### **VUE.JS WORKSHOP**

October 7 @GDL, Livestreamed



@WizelineAcademy



/WizelineAcademy



academy.wizeline.com



Get notified about courses:  
[tinyurl.com/WL-academy](https://tinyurl.com/WL-academy)