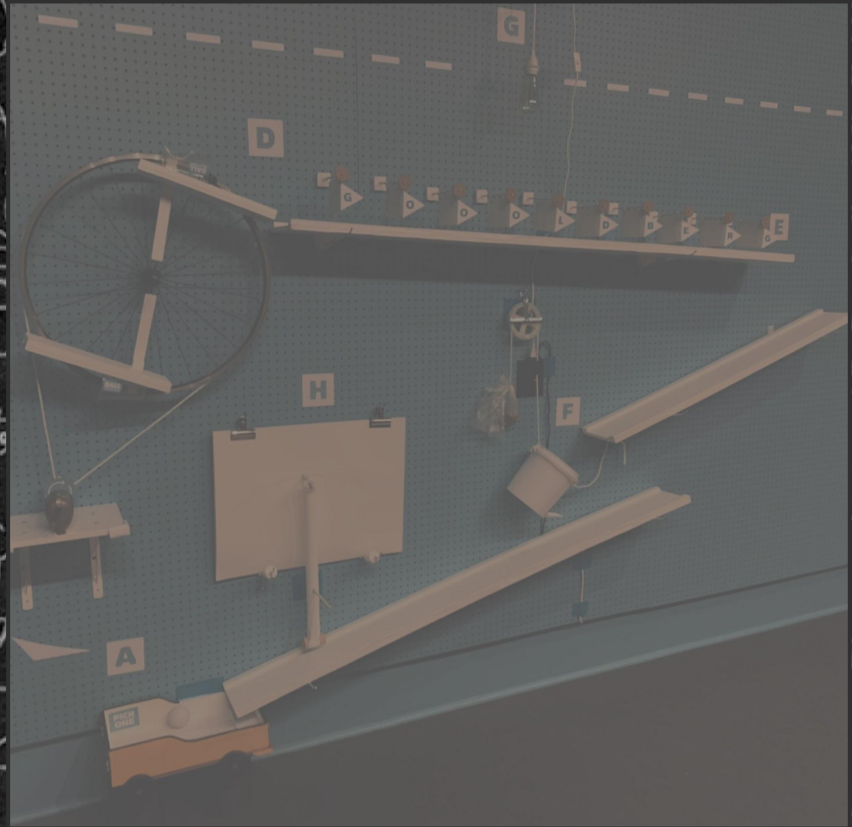


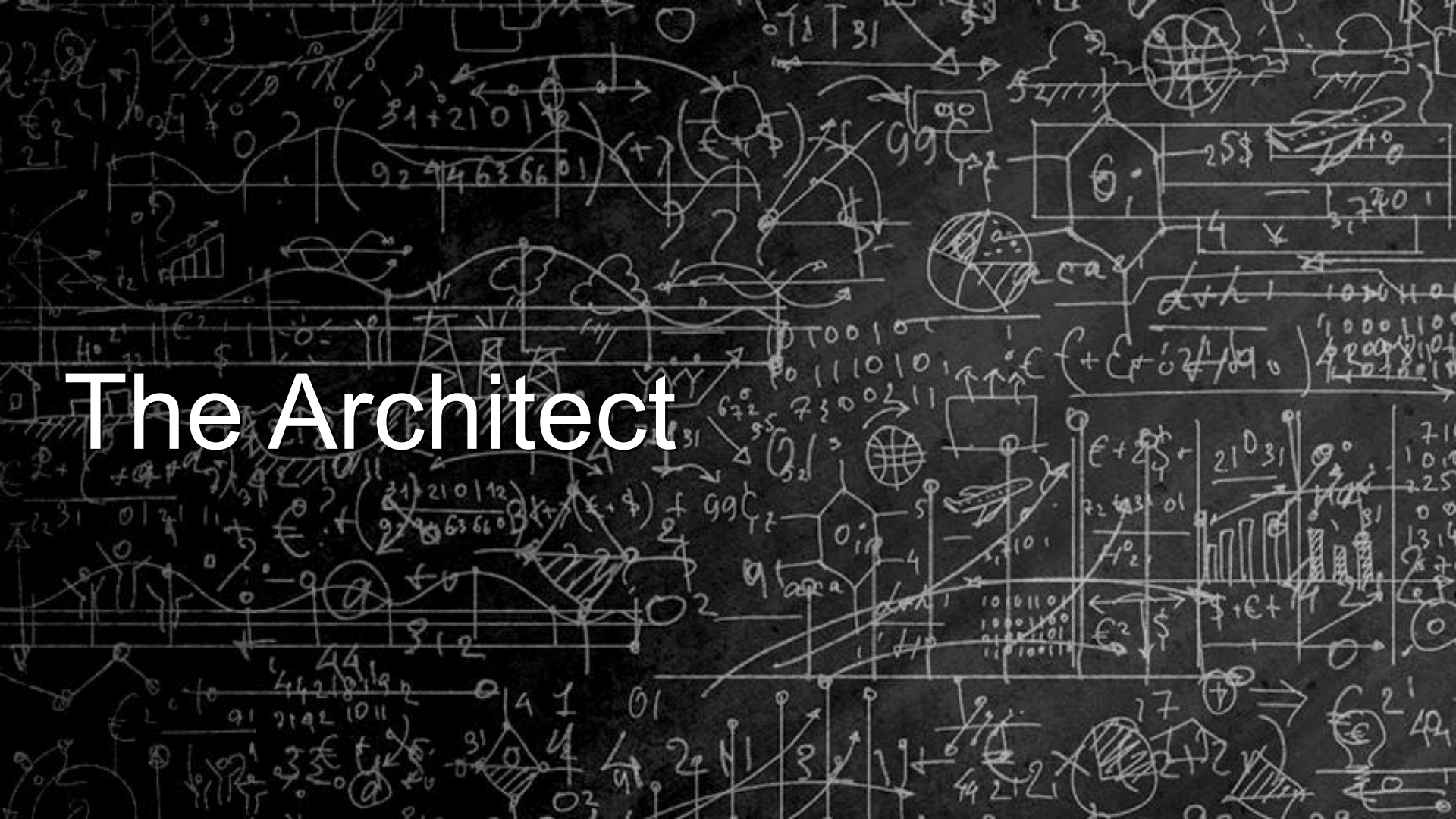
Software Architecture As Complexity Containment





- Software Architect @ [Trimble](#)
- Host @ [SE Radio](#)
- [.NET](#) developer since 2001
- IDesign Architect - [idesign.net](#)

About Me



The Architect

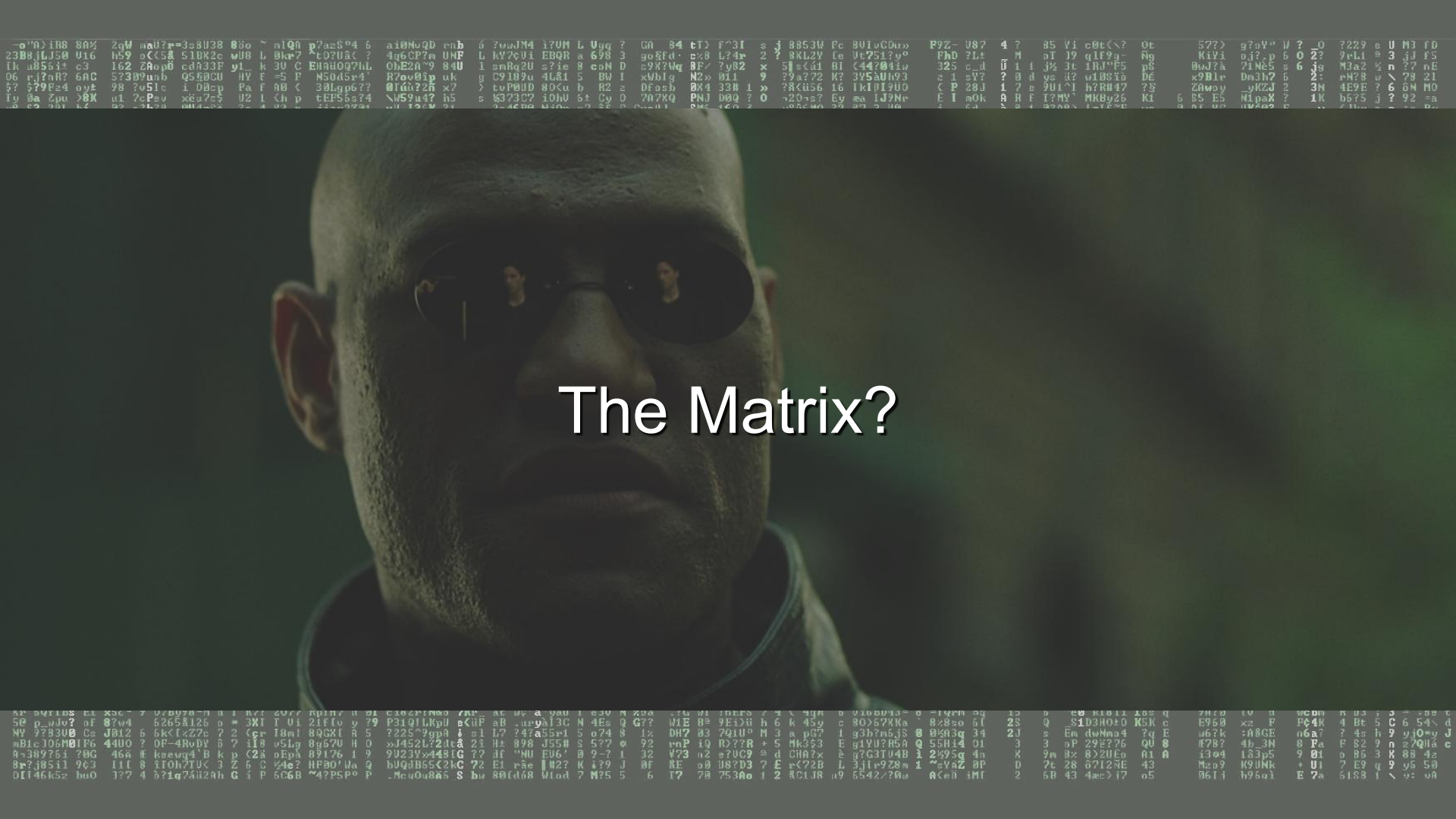


Where are my Features?



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23B8jLJ50 U16	h59 oC<5A 51BK2c wU8 L 0k+7	4q6CP7m UNP	L kV7cU1 EBQR a 698 3	yo5Fd c%8 L?4r	2 ? 8KL2V Fe	U7751?y0	Fh0 ?Lz	M	oT 19 q1F9g-	Ng	KiVi	o j? .p 5	0 2?	9rL1	e 3 jJ f5	
Ik a855i+ c3	162 Z8op0 cd033F y1_ k 3U C	EHAd0Q7HhL	l smRq2U s?ie 8 coM D	c9K?Vq 0F/ ?y82	x 51 s<41 01	C44?04iw	325 c_d	U 1 t j% 3t	1Rj"PF5	pS	0uJ?A	71N65 s 6	jg	M3a2	% n ?7 nE	
06 rJ7nR? 6AC	57309unb Q580CU	HY f =5 F	N50d5r4	R7ov0ip uk	y C9189u 4L&1 5	BW I xVhlg	N2>> 011	9 ?9a?72 K?	3V5AUH93	c 1 sV7 ? 0 d	ys u?	o18S1b	D6	x9B1r	Dm3h7 5	
57 579Ez4 oyE	98 7o51c i 00cp	Pa f 00 <	30Lgp677	01du726 x7	> toP0UD 80Cu b	R2 c Dfash	0K4 338 1	> ?R0U56 16	1k101900	C P 28J 1 7 e	9U1^1	h7R047	?S	Z0woy	_yKZJ 2	
Iy 0a Zpu >0K	u1 7cPev x0u7c7	U2 l Ch p	cEP56z74	N459u4? h5	s 8373C7 10hU 5t	Cy 0 707KQ	PNJ D0Q ?	0 720+57	Ey ea 1J9Mc	E I mOK	A R f	I?M" MKBy26	Kl	6 85 E5	HipaK ?	
q0 f2 2yL bL	07 c3h79 0U4z3a	7c 4 V3 r	Jiaq2261	u9 13cK ?1	2c46R8 NjOp	p7 âE C	GueUJ_ 8H6	16q ?	y06M0 72	07 3 U0	i 6d	â 8 1 8700?	Iaif E	ue	0 01 V0	DM07 E
q0 2 2 2 2 2	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	


50 p_0u07 of 8704	b265a12b 0 *	JX1 I U1 Z1f10 0 79	F310j1LRp0	5cUF	08	up9A13G	N 486 8	G77	U1E 8"	7E12U	h 6 k 459	c 002678Ka	0 828so	51	Z8	q	S103002U	KSk c	e	ky60	xz F	PC9K	4 Ht	5 C b 54n	d
NV 7283U0 Cs	J012 6 6k<IzZ7c	7 2 Cc	1Bn1 80GKI	8 5	2225?9p0	4 c1 L7	242a55r1	S 074 8	1x	DH7 03	701U0	N 3 a p07	1 g3h?n6JS	0 00803q	34	2J	s Em duMmo4	?q E		u67k	:A8GE	n6a7	? 4s	h 9 9 9 0	uJ c
mB1c106M0IF6	4400 ? 0F-4R0DV	6 7 118	v5Lg 8y67U	H 0	oJ452L72t2a	21 H+ 898	J55H S 577	0 92	rnP 10	R?77R + 5	Mk353	E g1YU?R5A	Q 55814	01	3	3 3 0P	29E?76	QU 0		E78?	4b 3N	0 Fa	F 82 9 n z	7QHa	
A-38976i 70G	46A # keevq4 B k p	C2& oEpA	89176 1 9	9 023V>448IG	7? af "NU	E06' 0 9-?	1 32	V73 02	e?UC9	a d CHA?x	e g?G3T	U4B 1	2495g	4n	X	9m 0x	8>2U0o	A1 0		13w4	133p5	9 01	o 86 3 K	88 4z	
8r738511 963	111 8 i10h71U<	3 Z 6 C	%4e? HP00'Wa	Q	buQd865C2kC	72 E1 r&e	112? K i79 J	0f	RE o0	U8?D3 ?	E c<72B	L 3J1r9Z8n	1 ~eVaZ	0P	D	7c 28	6712NE	43		Mz09	K9UNK	+ U1	7 E9	q 9 96	50
DI46k5z bu0	177 4 0?17q502aH	G i P	6C6B ~4?PSP0	P	.Mc0u08A6	S bu	80td68	U1od 7	M25 5	6	I7 20	7530a	1 2	801J8	09	6542/?0u	A<e0	IME		061i	h96qi	E 7a	6188	i 1 9c	0A



The Matrix?

o"n)iR8 80% 2qW maU7r=3a8U38 8uo ~ nIQn p7a2S%4 6 ai0MvQD enb 6 3vuuJM4 i?UM L Uyy ? GA 84 tD F?3I s j 8853W Fc BUIvCbu>> F9Z- U8? 4 ? 85 Vi c0t<? Qc 57?> g7oV" U ? _O ?229 a U M3 fD
23B8jLJ50 U16 h59 oC<5A 51BX2c wU8 L 0ka? 4q6CP?m UNP L kY76Vi EBQR a 698 3 y05Fd c%8 L?4r 2 ? 8KL2V Fe Ut751?yo FhD ?Lz M ? 0 2? 9rL1 e 3 jJ f5
ik u855i+ c3 162 Z8op0 cdh33F y1_ k 3U C EHAd0Q7hL OhE2A~9 84U l smRq2U s?ie 8 coM D cyK?Wq 8F? ?y82 x 5l s<41 0l <44?04iw 325 c_d U i t j% 3t 1Rj" F5 Ng 0uJ?A 7iNe5 s 6 0 2? 9rL1 e 3 jJ f5
06 rJ?nR? 6AC 57309unb Q550CU HY f =5 F N50d5r4 R7ov0ip uk y C9189u 4L81 5 BW I xWhig N2> 011 9 ?9a?72 K? 3V5AUh93 c 1 sV7 ? 0 d ys U? w1081b D6 k9B1r Dm3h7 5 6 2? rN?8 u \ 78 21
5? 579Ez4 oyE 98 7o51c i 00cp Fa f 00 < 30Lqp6?? 01uu?26 x? > cvP0UD 80Cu b R2 z Dfash 0K4 33R 1 > ?RGu56 16 1k10I9U0 C P 28J 1 7 e 9U1?1 h7RH47 ?S Z0woy _yKZJ 2 3N 4E9E ? 6 0N MO
Iy 0a Zpu >0X u1 7cPav x0u7c? 02 l <h p cEF56c?4 N459u4? h5 s 8370C? 10hU 5t Cy D 707KQ 0NJ D0Q ? 0 ~20>5? Ey 8a 1J9Me E l mOK 0R f I?MV MKBy26 Kl 6 85 E5 HpaK ? 1K b675 j ? 92 _a
U 0a Zpu >0X u1 7cPav x0u7c? 02 l <h p cEF56c?4 N459u4? h5 s 8370C? 10hU 5t Cy D 707KQ 0NJ D0Q ? 0 ~20>5? Ey 8a 1J9Me E l mOK 0R f I?MV MKBy26 Kl 6 85 E5 HpaK ? 1K b675 j ? 92 _a

0P 04Y1B8 EL x0c- 7 U?0P28~n u i K? 2077 0Pn?r u 08 E106F1800 ZAK AC 0V 8 V0U l 63V n 200 710 01 1BES? 7 7 8 398 d 0408041- 0 -1WCM 0H 13 0 0 50 K1011 182 q 7H70 1W 0 WCDH K 03 5 3 7 00 t
50 p_u0e? 0f 87u4 5265R125 o * 3M1 T 01 21fco o 79 03101LKp0 pC0F AB .un9A13C N 465 Q C?7 U1E 88 9E1Dh h 6 k 45y c 80>67XKa - 8:28ao 5L 23 0 S1D3H010 KSK c 0960 xz P 064K 4 Dc 5 C 6 54\ d J c
NV 7283U0 Cs J012 6 6k<1x27c 7 2 Cpe 1Bn1 80GKI 8 5 2225~79p0 1 1 L7 242A55r1 5 074 8 1x DH7 03 701U" N 3 a p07 l 03h?n6J5 0 0203q 34 21 2 2 Em dwMma4 ?q E 067k :A8GE n6a7 ? 4s h 9 y 0w y
mB1c106M0IF6 4400 ? 0F-4R0VU 6 7 1I8 v5Lg 8y67U H 0 0J452LV221t4 21 H 898 J55H S 577 0 92 rnP 10 R?77R + 5 MK353 E 01YU?H5A Q 55H14 01 3 3 0P 29E?76 Q0 0 E78? 4b 3N 0 Fa F 82 9 n z 7QhA
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8r?j8511 963 111 8 i10h71U< 3 Z 6 C 24e? HP00'Wa 9 buQd8B5C2k 72 E1 r8e || 02? K i?9 J 0f RE 00 08?D3 ? E e<72B L 3J1r9Z8n 1 ~eV6Z 0P 0 7c 28 6712NE 43 Mz 09 K9UNK + U1 7 E9 q 9 y6 50
D1746k5z bu0 17? 4 h?1q7A822ah G i P 6C6B ~4?P5P0 P .Mcq0u8A6 S bu 80t68 U1ad 7 M?5 5 6 17 20 7530a i 2 8C1J8 u9 6542?70u A<e0 iMF 2 6R 43 4mc>17 05 061i h96qi E 7a 6188 i \ 9c: 0A

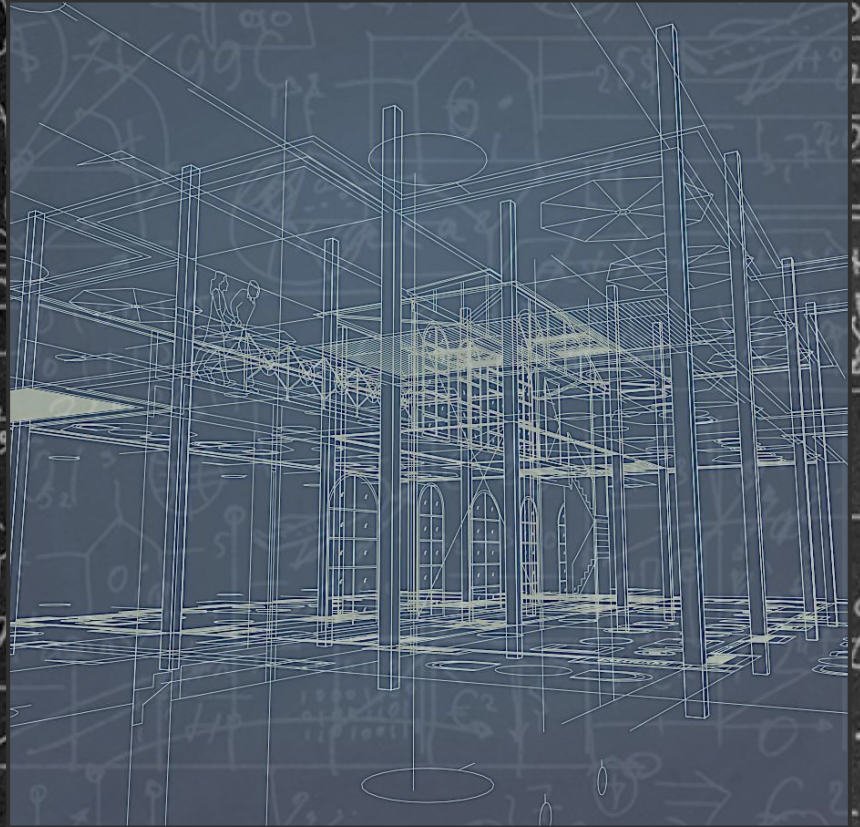


When Projects go Horribly, Horribly Wrong

Sources of Complexity

- Technological Complexity
- Integration Complexity
- Organizational Complexity
- Operational Complexity
- Market Complexity

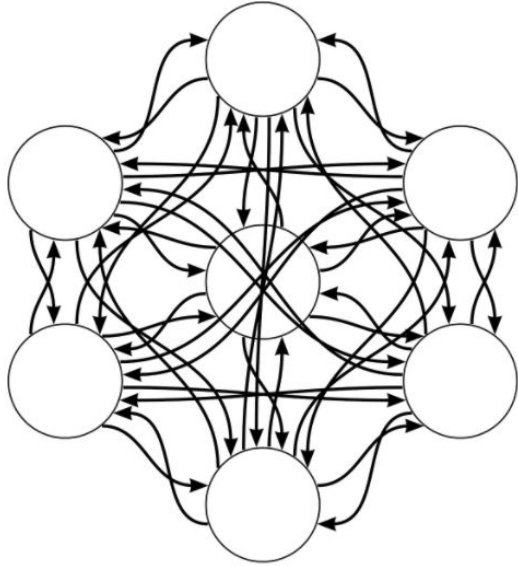
Containing Complexity



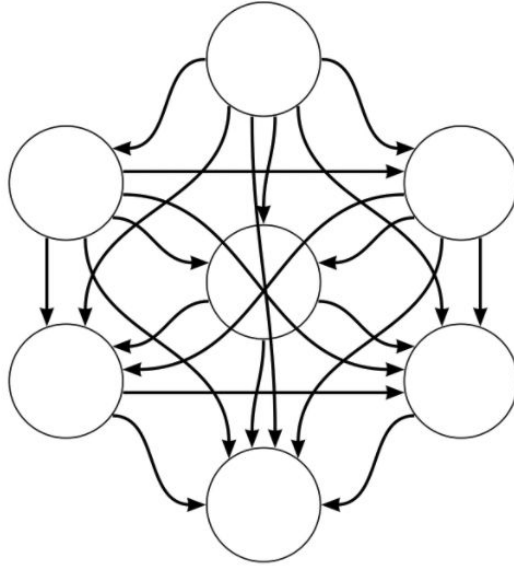
Contain
Complexity or
It will
Contain You



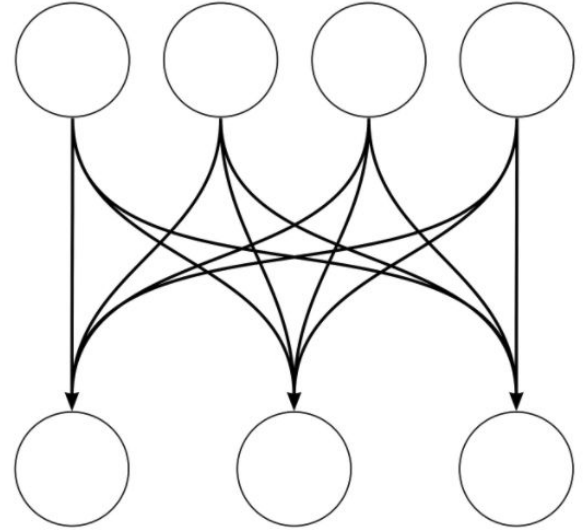
Complexity Kills



7 Nodes - No Constraints



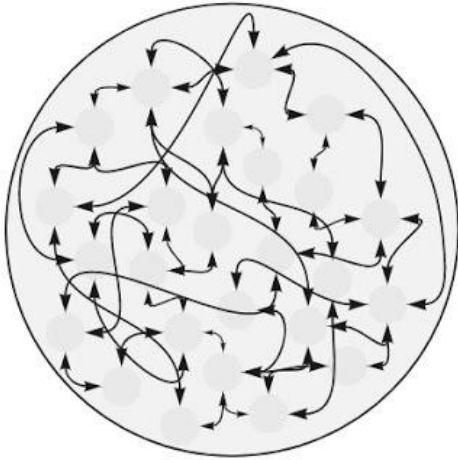
7 Nodes - Acyclic



7 Nodes - Layered

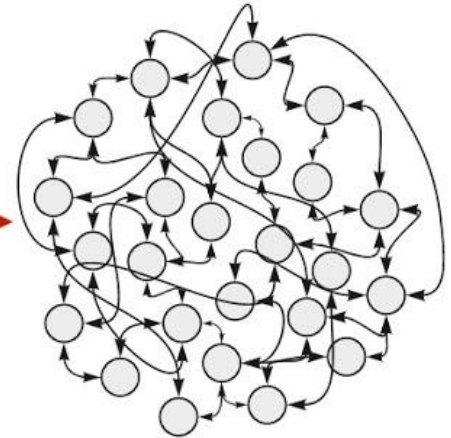
Complexity Kills

The Monolith
of Doom



Centralized Spaghetti

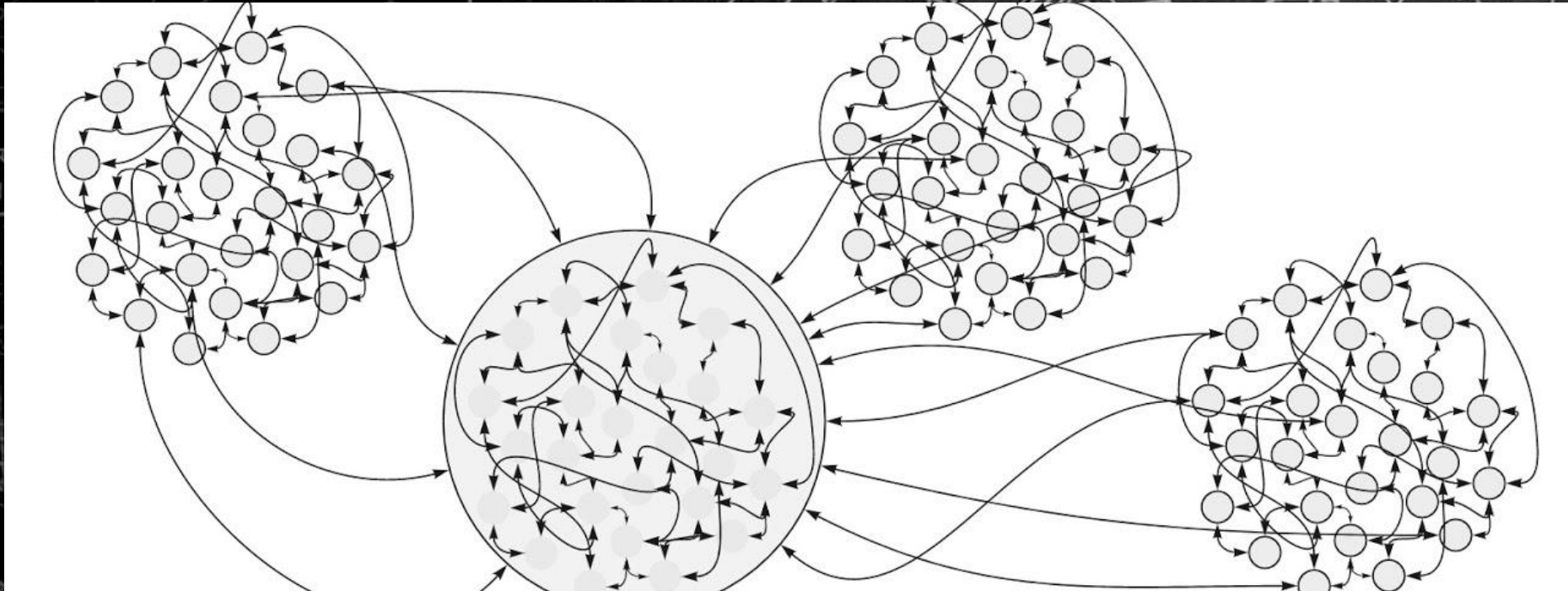
Microservice
Madness



Distributed Spaghetti



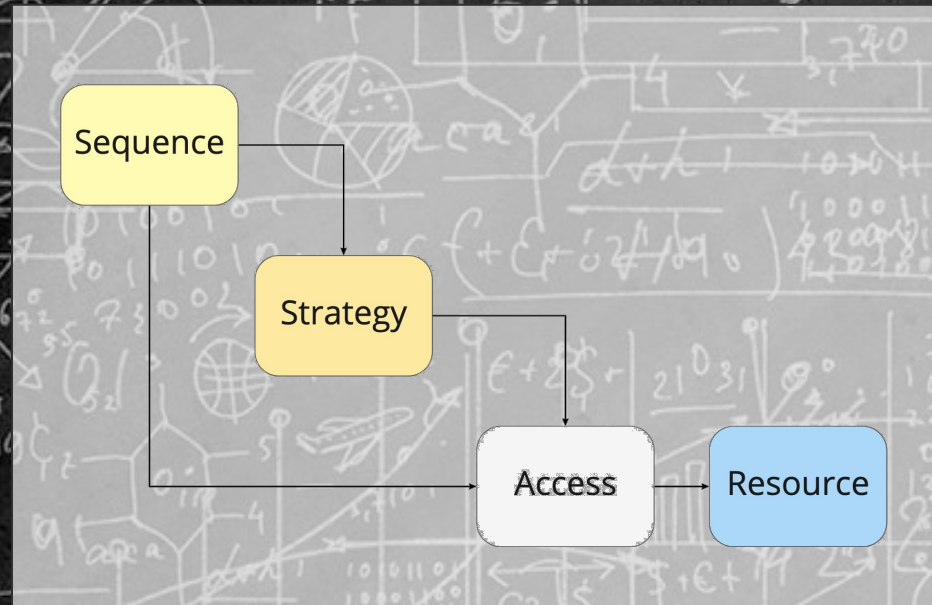
Complexity Kills



Complexity Containment Strategies

- Identify Capabilities
- Enforce Constraints
- Clarify Communication
- Commit to Vigilance

Identify Capabilities



Enforce Constraints

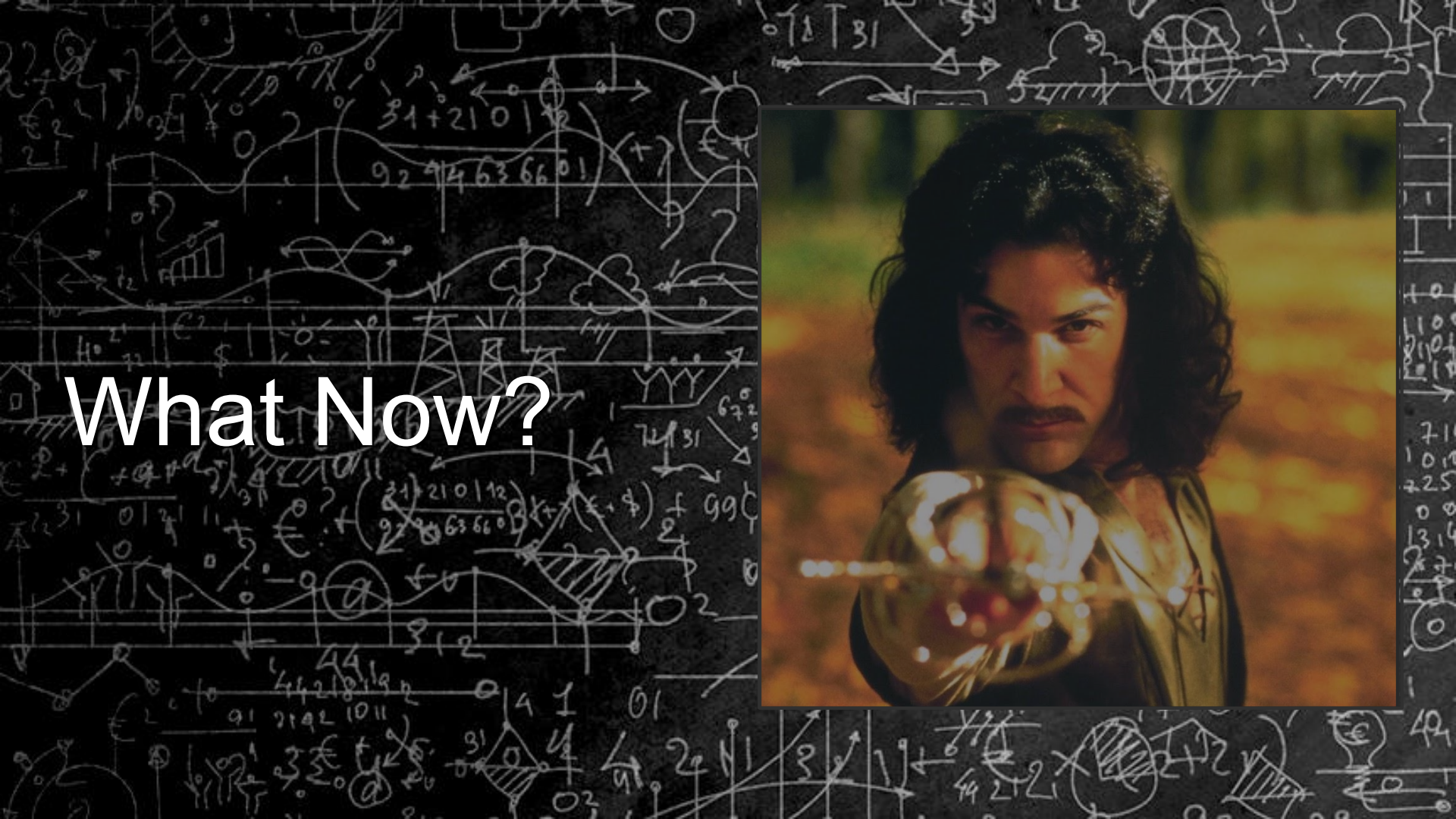


Clarify Communication



Commit to
Vigilance





What Now?



Software Architecture As Complexity Containment

jeffdoolittle.com

Righting Software
By Juval Löwy

rightingsoftware.org

Exploring Requirements
Gause & Weinberg

