Application Modernization in the Cloud Age



Application Modernization Why it's Occurring and is Important

Business Agility

Ability to bring new application functionality online in real time

Bring new initiatives on line quickly

Adjust rapidly to changes in the competitive landscape Immediately respond to user concerns

Responsiveness

Rapidly diagnose and remediate complex issues

Maintain SLI, SLO, and SLA goals

Scale-up instantly as application demand peaks

Scalability

Scale-down as application demand ebbs **Cost Effectiveness**

Add and use resource credits based upon application scaling requirements

Reduce or eliminate application downtime by applying ondemand resources

The Evolution of Application Architectures

- Monolithic
 - 1948-1997
- SOA
 - 1998-2011
- VMs
 - 1972 IBM
 - 1999 VMware

• Microservices

• 2011-

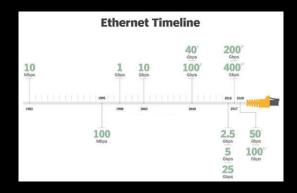


- Waterfall Design
 - 1970
- Agile
 - 2000

Why Application Architectures Evolved

- Mobile Internet
- Faster and more reliable backbone networks
 - Highly distributed services became much more viable
- Compiled to JIT VM code
 - Smalltalk ~ 80s
 - First JVM 1994
- Faster processors, multi-core, denser storage, etc.

Mobile Network	Average Speed	Peak Speed
2G	0.1Mbps	0.3Mbps
3G	3Mbps	7.2Mbps
3G (HSPA+)	6Mbps	42Mbps
4G LTE	20Mbps	150Mbps
4G LTE Advanced	42Mbps	1Gbps
5G	500-700Mbps	10 or 20Gbps



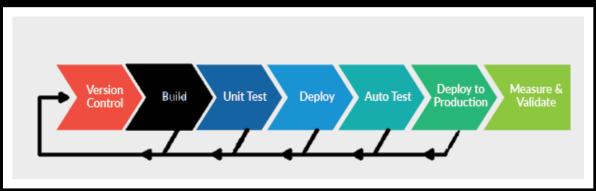
The 5 most common Application Modernization Options

Rehost	Move applications to cloud Infrastructure as a Service (IaaS) without altering their architecture
Refactor	Change the application code to fit a Platform-as-a-Service (PaaS) model
Rearchitect	Modify or extend the existing application code to become cloud-native
Rebuild	Rebuild application on PaaS, remove code for the existing platform, and rearchitect to take full advantage of cloud-native features
Replace	Replace existing application with a commercial Software-as-a-Service (SaaS) application

Where Enterprise Observability Helps Application Modernization

Application		Cl	oud Ser	vice Ty	ре			Cloud	d Config	guration	Туре	Cloud Configuration Type								
Modernization Option	laa	aS	Pa	aS	Sa	aS	Single	Cloud	Multi-	Cloud	Hybric	-Cloud								
Rehost	X		Х		Х															
Refactor							Х		Х		X									
Rearchitect	X 🦲		Х	× 🦲		Х		Х		X										
Rebuild			Х				Х		Х		Х									
Replace					Х		Х		Х		Х									

The CI/CD Pipeline



CI/CD Tools

Enable automation and monitoring for apps dev, integration and testing to deployment



Observability's Role in CI/CD Pipeline Optimization

Discover and address 'unknown unknowns'

Issues you don't know exist

Catch and resolve issues early in development

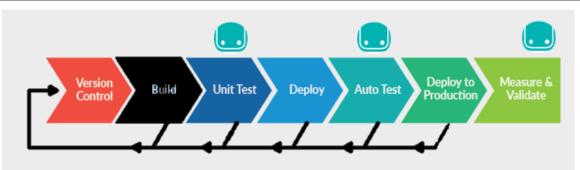
Automatically scale observability

Enable automated remediation and self-diagnosing application infrastructure

Shift-Left Observability

For Building Better Software Faster by

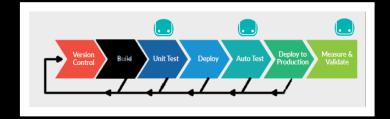
Optimizing Unit Test and Auto Test



And of Course, for Production

Optimizing the CI/CD Pipeline

- Unit Test Values
 - Automated Profiling provides code level details for triage
- Auto Test (and Production) Values
 - Automation

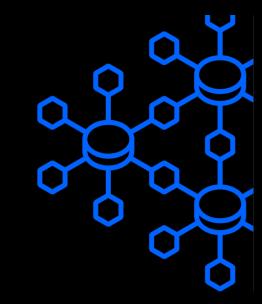


- Discovers/maps apps, services, infrastructures, events, and dependencies
- Context
 - Ingests all observability metrics, traces each request, profiles every process and updates dependency maps in real time
- Intelligent Action
 - Machine Learning Analytics for optimizing application performance

Key Enterprise Observability Capabilities for

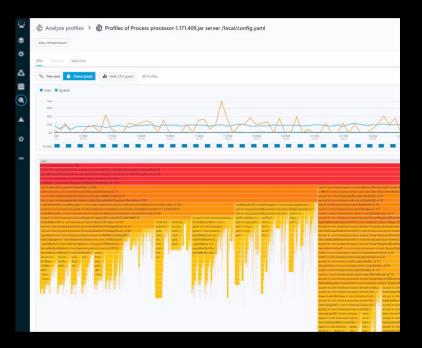
Application Modernization

Automation



Automatic Profiling

- Automatic and continuous code level profiling
 - JVM, PHP, NodeJS, etc. tracers
- Profiler Sensor from the Agent
 - Always on, but not profiling all the time



Enterprise Observability Automation

Immediate	
Exact	
Effortless	

Q	,, Application (4) ⊖.⊖ Robot-Shop - > ⊖ cart HTTP @ Node.js			
۲	🚍 Stack 🤌 Upstream / Downstream 🕞 KBs Serv	vices (1) 🍷 👫 Analyze C	alls	
0	Applications 🛞 Infrastructure 🕲 Kubernetes			
R	Executed by 1 Docker Container			
	cart (robot-shop/cart-9d7fbc866-z27rw)	CPU Total Usage 6%	Memory Usage 44.91 MiB	
	Executed by 2 Garden Containers			
X	3aebe4be-ce0b-4294-5f08-ae79	CPU Total Percentage 0%	Memory Usage 100.85 MiB	
Q	3fe2427a-a320-4555-796a-59b3	CPU Total Percentage 0%	Memory Usage 107.22 MiB	
	Executed by 3 Node is Apps			
A	(19) cart v1.0.0	GC Pause 537µs	RSS 117.32 MiB	
٥	(B) cart v1.0.0	GC Pause Oµs	RSS 117.05 MiB	
	() cart v1.0.0	GC Pause 977µs	RSS 65.62 MiB	
ô	Executed by 3 Processes			34:00 11:4 ar 02 Ma
	Pro anda	CPU Usage (User)	Virtual Memory	
	Infrastructure Issues & Changes	Top Endpoints	Latency	Calls Errone

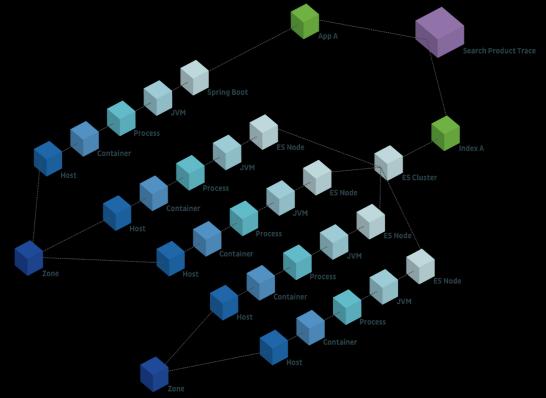
Context Guide

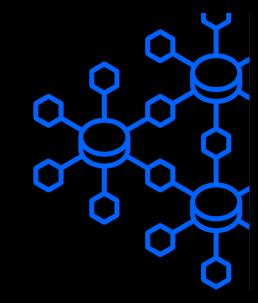
Dynamic Graph for rapid troubleshooting.

A "GPS" for enterprise applications.

Dynamic Graph

Continuously updated, full stack, internal data model of application structure and dependencies



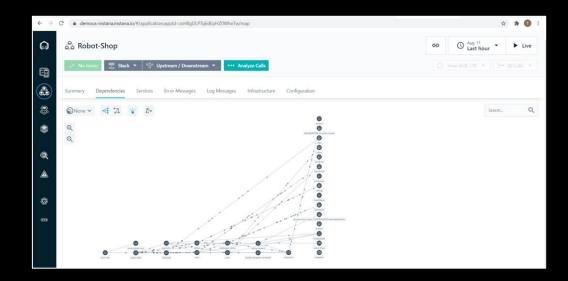


Context

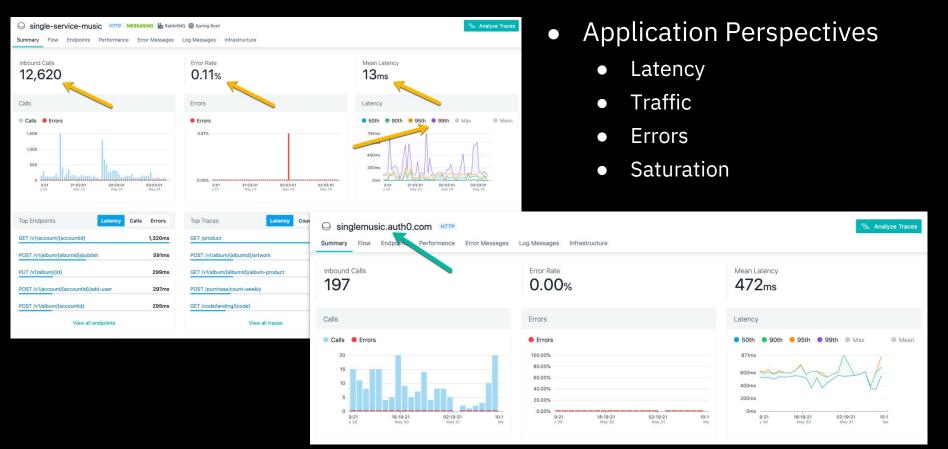
Application Dependency Maps

For Each Application

- Application service dependencies
- Calls between services
- Application architecture layout view
- Dashboards, flows, calls and issues service views



Golden Signals for All Services

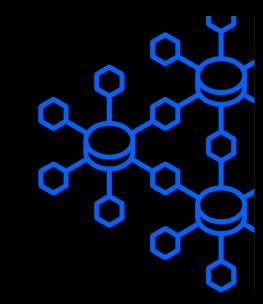


Error and Log Messages

- Error messages
 - Service errors that happen during code execution
- Log Messages
 - Collected from a log message with severity WARN or higher

😓 Shop	電 Analyze Traces
Summary Dependencies Services Performarce	Error Messages Log Messages Ir frastructure
Error Messages	Analyze Messages
Error Message	Count ↓
Erroneous call without error message	12,443
java.io.IOException: Connection reset by peer	424
[es-node-two][172.31.27.58:9300][indices:data/read/sear	rch] • 1
[es-node-one][172.31.27.57:9300][indices:data/read/sear	rch] • 1

Intelligent Action



Machine Learning



- Signals Instana trains on
 - Call Rate (sudden drops)
 - Error Rate (sudden increase)
 - Latency (sudden increase)
- Signals tracked from a variety of sources
 - Traces
 - Endpoint, services, app perspectives
 - Metrics

Unbounded Analytics

- Unbounded Analytics focuses on
 - Distributed Traces
 - Logs
 - End User Monitoring

□ trace.latency ≥ 2000 Orouped by trace.andpoint.name × Change Group Result 1 Group Group Count ↓ Earliest Timestamp Latency (mea GET /docale/shop 27,627 2019-05-21 10-39-24 2,575m s	application.na	me equals	Shop									
Result 1 Group Group Count & Earliest Timestamp Latency (mea	C trace.latency	> 2000										
Group Count & Earliest Timestamp Latency (mea	Grouped by trace.endpoint.name x Change Group											
	Grouped by trace	e.endpoint.	name ×	Change 0	Broup							
GET /:locale/shop 27,627 2019-05-21 10:39:24 2,575ms		e.endpoint.	name ×	Change C	quoié							
	Result 1 Group	e.endpoint.	name ×			Earliest Times	tamp		Later	ncy (mear		

Distributed Trace Analytics

Finds EVERY slow request

Analyze Tra	ices > Trace GET /es/shop					© Last 6 hours ▼ ► Live
*) ,	GET /es/shop Trace ID: 001862c8	eccfebb9				₫ Download X
		Sub Calls 10	Errors in Calls O	Latency 3.12s	Call Details GET /productsearch HTTP	
	Timeline O Started: 15/28/20			Colorize by Endpoint Ter	Senice Chnology To ③ GET (productsearch of) produc Infrastructure @ @ Instana Deno - Product Search 0.0.1	tsearch
	Dms 622ms GET (wishing GET (http: GET (puestions GET (puestions	1254	1876	2,455	3.12s Caller Details Heat 10-72-35-36-127.ec.2.html Repeat Path Induction	
	Service			d Time ↓ Errors	URL http://g-172-31-96-127.ec2.internal:85/productiveer Parameters name-demoproduct202058645555 Method	ch
	 shop-frontend shop 		1 3,118ms 1 3,118ms	0	061 Stutus Code 200 - OK Contest Langth 194	
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	productservice	@ GET //repository//see Prev	1 3ms	0	Neat b-072-05-05-127422/attented.85 Respect Path gioductoarech Path Templan gioductoarech Patentelens	
1)	Calls			Colorize by Endpoint Tex	name+demoproduct2005904555 Atended Ate	
	GET jes/shop HTTP To @ GET /scsie/shop of O shop-trans	Oms 624	ms 1,25s	1875 2.496 3.12	200 - OK	
	GET /shop HTTP				3,118ms Caller Stack Trace	

Smart Alerts

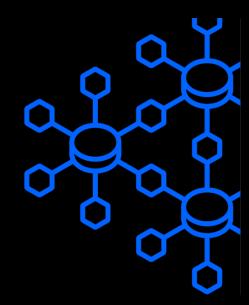
- Use Case Based Alerting
 - Alert suggestions and recommendations
 - Performance, Availability, Errors, Bugs
 - Automated and manageable alerts
 - Customizable Scenarios, Real Time visualization, Seasonality
 - Arbitrary filtering
 - Scope limitations, Traffic narrowing

$\leftarrow \ \rightarrow$	C a	dem	oeu-instana.instana.io/#/alerts				Ŕ	* (T Upda	te :
۵	\$	App	olications			Θ	C Aug. 10 Last hour		Live	
50	dia Ap	pplica	tions O Services A Smart Alerts							
	Gl	lobal /	Application Smart Alerts (0) Application Smart Alerts (5)			Name 👻 🕇 🖛	Ascending Search		Q	
٢	1	۵	Calls are slower than usual Slow Calls, Latency	Application Smart Alert aggregated	A Robot-Shop			п		
Q			Erroneous call rate is higher than normal Erroneous Calls, Error Rate	Application Smart Alert aggregated	& Robot-Shop			n.		
		n	Error rate too high on Loadbalancer Erroneous Calls, Error Rate	Application Smart Alert aggregated	& Robot-Shop Backend			×		
٩			Too many calls logging Error messages: "HikariPool-1 - Connec- tion is not available, request timed out after 5000ms." Error and Warning Logs, Logs Count	Application Smart Alert aggregated	All Service (All Calls)			n		
	4	Φ	Too many Errors (HTTP 5300) HTTP Status Codes, Status Code	Application Smart Alert aggregated	é.c. Robot-Shop			n.		
							ADD GLOBA			
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Instana

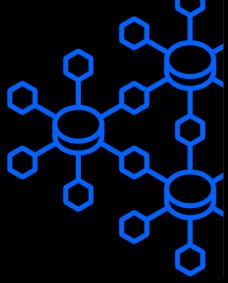
is

Enterprise Observability



Instana Values for Key Stakeholders

- Developers
 - Test new code functionality before committing
- DevOps
 - Enable smooth CI/CD pipeline integration
- SREs
 - Ensure pre and in-production reliability and availability
- Ops
 - Continuously monitor and respond to potential problems and alerts generated by Machine Learning and AIOps



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Tom Fisher															
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