What does it take to Operate and Maintain a GIS system?

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IT Manager GIS Operations and Maintenance (Electric and Gas)

Together, Building
a Better California

Purpose/Goal

"*The day you stop learning is the day you stop growing*"

- Someone intelligent and influential I think

- The intention is to share how things are being done; not to claim it's the best and only way to do things

History/Background of GIS @PG&E

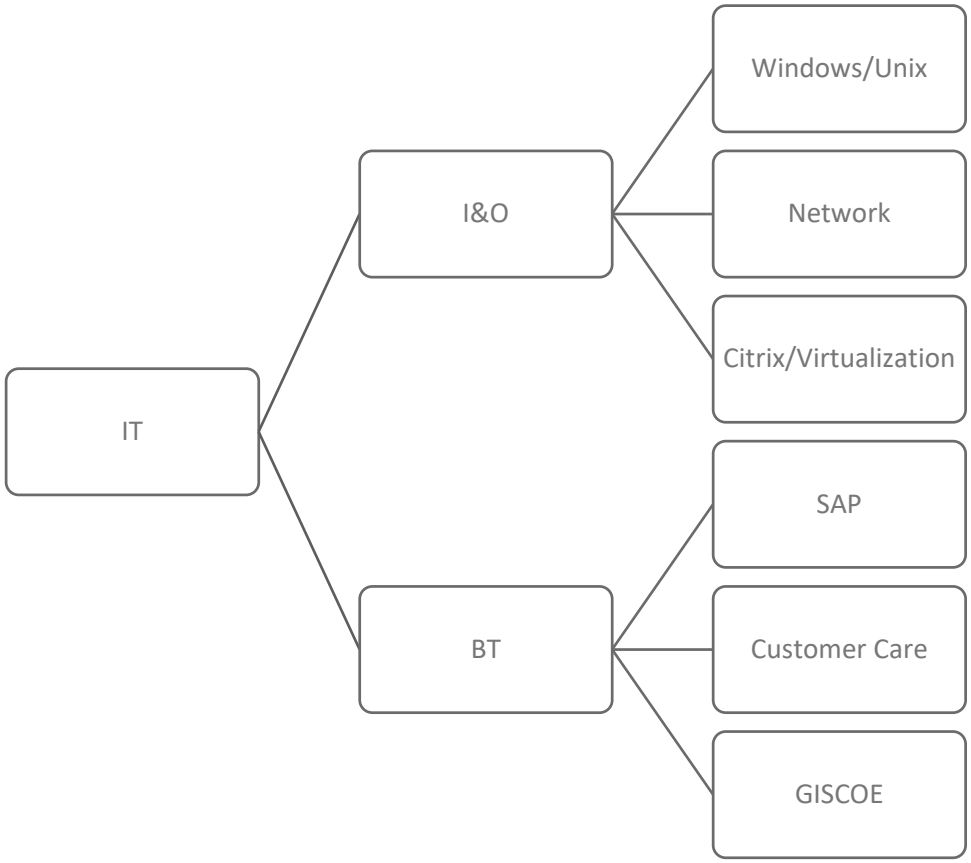
How GIS came about @PG&E

- Various GIS projects that started around 2012, for ***four major towers*** (ED, ET, GD and GT) ended in 2015
- GISCOE took birth Jan 2016 to help operate & maintain GIS application; and to provide single point of contact for all GIS related projects
- RFP floated for GIS Operations managed services
- TCS started with GISCOE Ops managed service July 2016
- Scope included
  - Mission Critical Apps for all the four towers
  - Integrity management applications (primarily for Gas)
  - Mobile Applications
  - Minor Enhancements, Break Fixes and emergency releases

Internal

History/Background of GIS @PG&E

IT Landscape @PG&E



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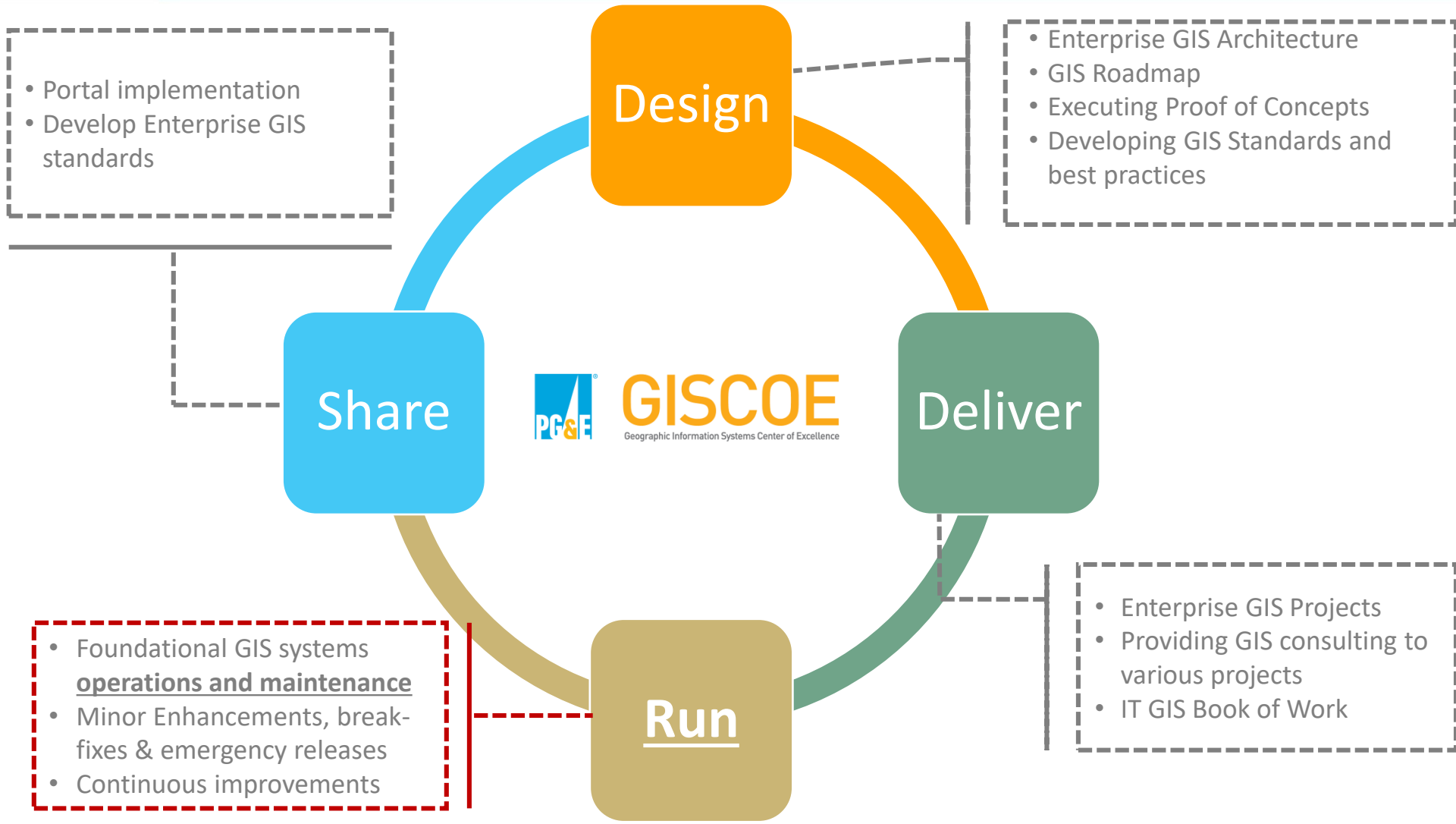
Current Org and functional structure



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History/Background of GIS @PG&E

GIS Technology Landscape @PG&E

- Editors over Citrix, Web Viewer, nightly maintenance and integration jobs.
- ~500 servers in two data centers
  - Prod, QA, Test, Dev, Data conversion, Performance testing environments for all the towers
  - Combination of physical and virtual
- ~5% of compute in data center used by GIS
- GIS integration with SAP, DMS, MDMS, Customer Care and so on

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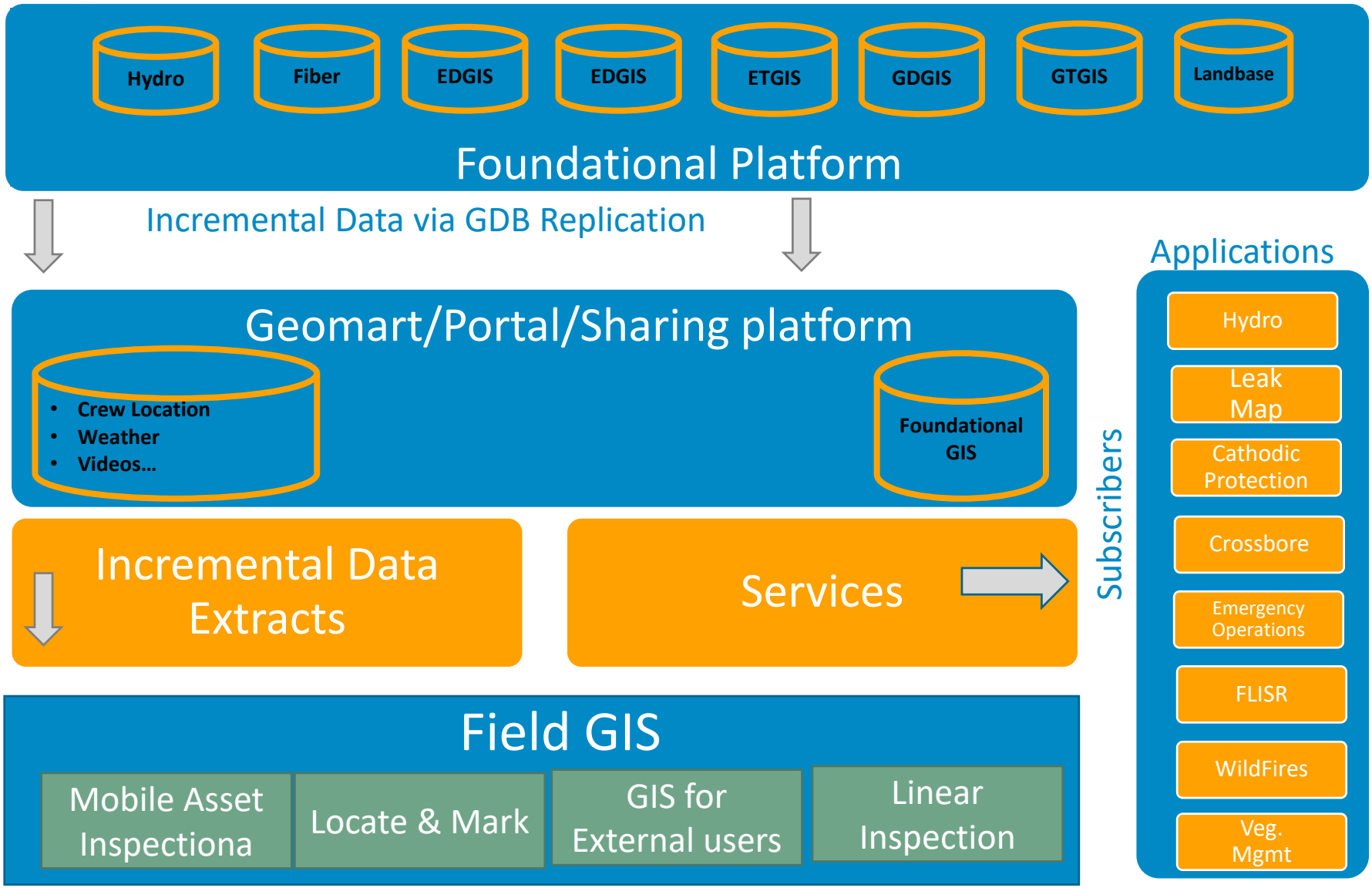
GIS Landscape



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History/Background of GIS @PG&E

Technologies in use

Tier	Technology
Operating Systems	Microsoft Windows, IBM AIX and Redhat Linux
Databases	Oracle, SQL Server and PostGresSQL
Web Server	IIS, ArcGIS WebAdaptor
Application Server	ArcGIS Server, Portal
Client	Silverlight, JavaScript, Runtime, Engine
Virtualization	Citrix, VMWare
Desktop	ArcGIS Desktop, ArcFM
Automation/Scheduled Jobs	Automic UC4
Integration	flat files, ftp, WebLogic, Layer 7

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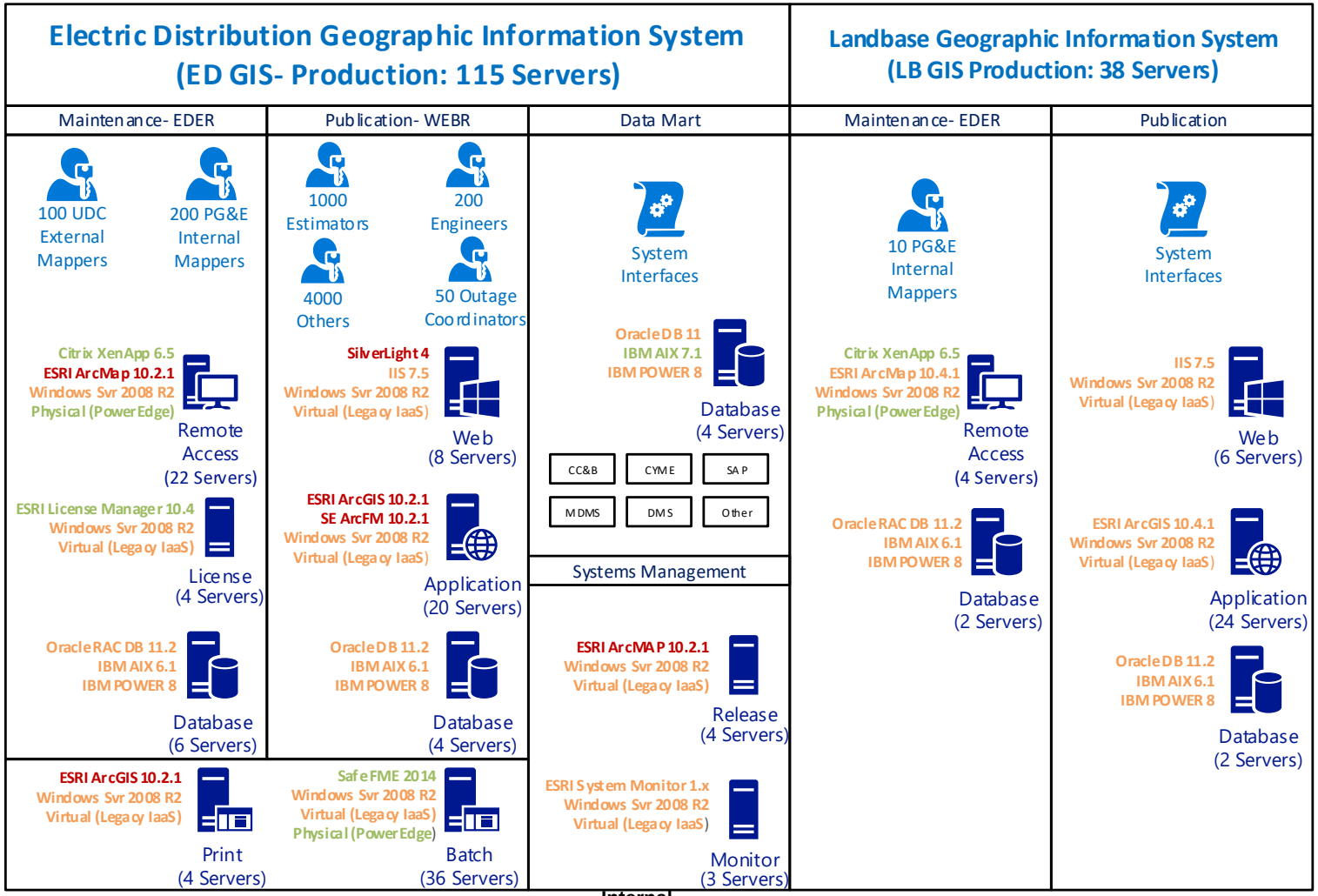
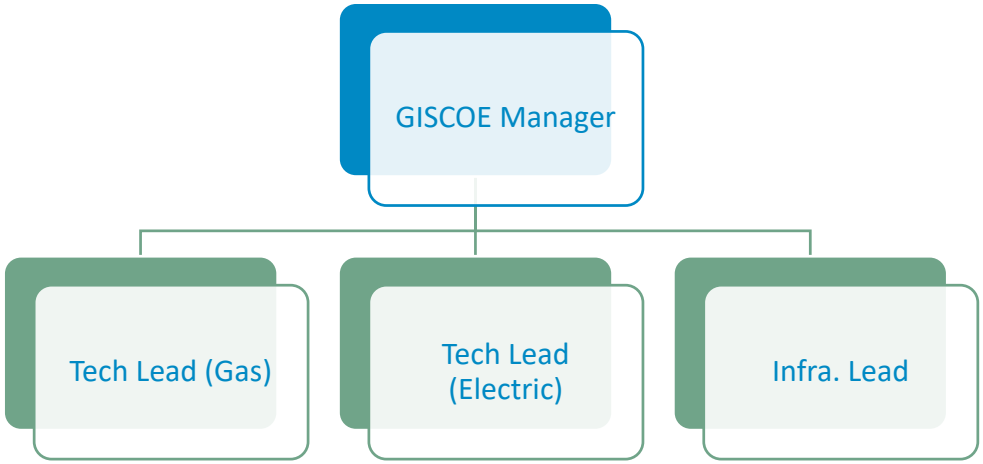
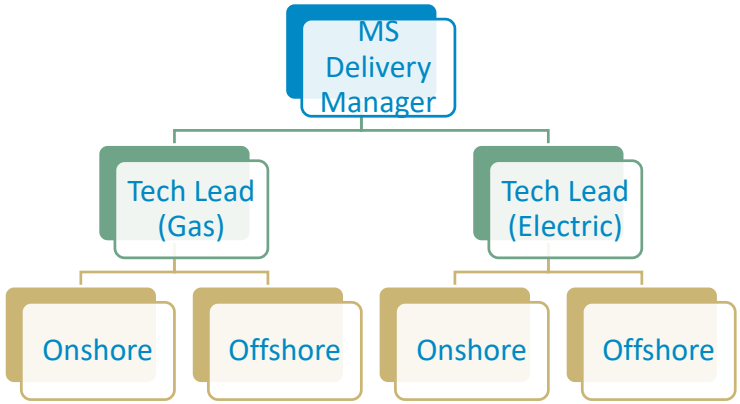
EDGIS and LBGIS Infrastructure

Birds eye view



Support Structure





- Close collaboration with Managed Service provider
- Daily check-ins and huddles
- Periodic governance meetings

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Support Model: Incidents

Methodology

- Intake
- Triage
- Classification and assignment
- Evaluation
  - Bug?
  - Enhancement?
  - Emergency?
- Prioritize and schedule
- Repeat
- SLA Driven

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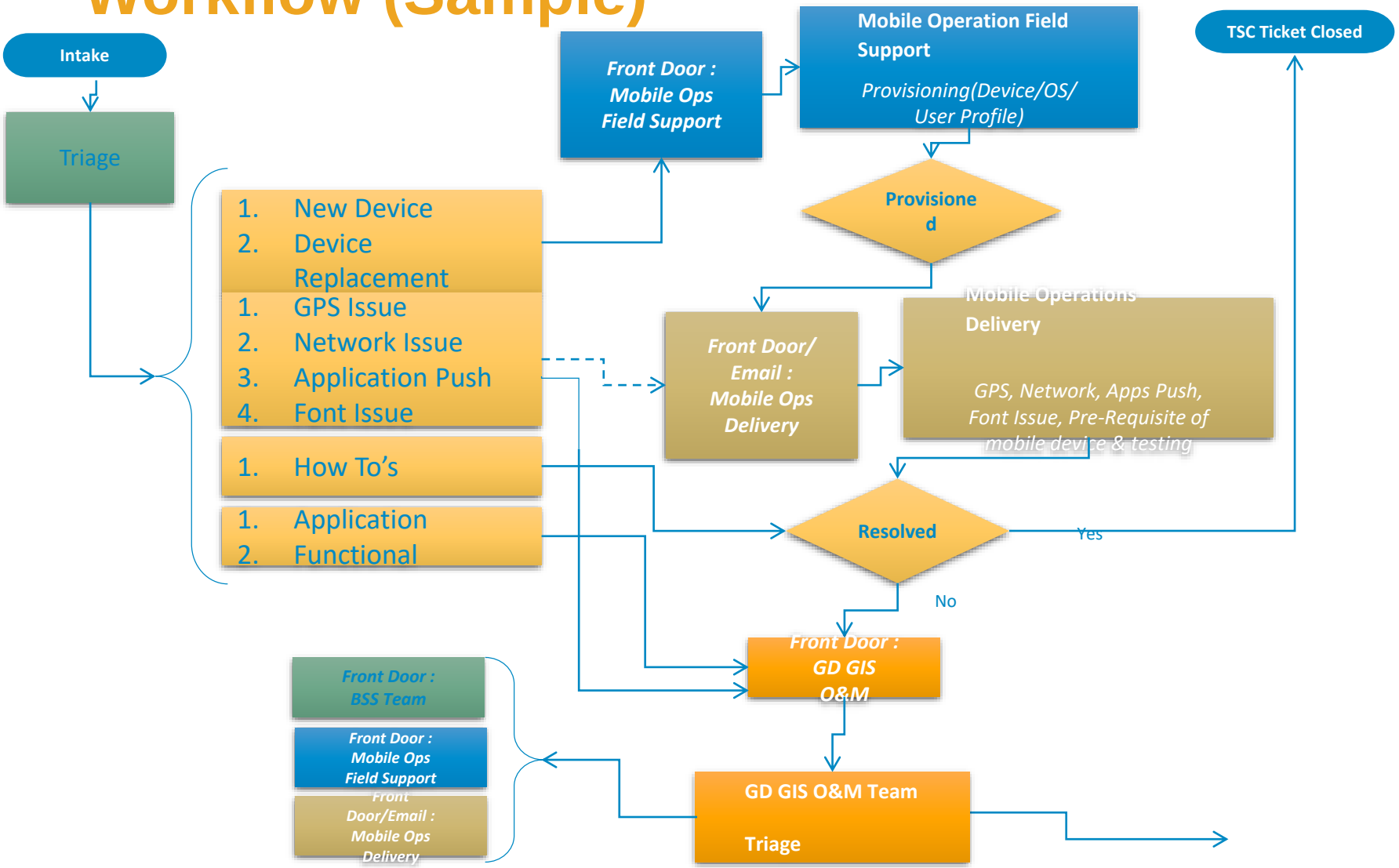
Support Model: Incidents

Workflow (Sample)



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Support Model: Work Orders (cont…)

Methodology (repetitive tasks*)

- Intake (primarily through work order)
- Prioritize
- Execute
- Evaluate if need to be automated
- Repeat
- Not SLA driven
- State Zero
- Rebuild Geometric Network?

* Eg. Access requests, one time data requests, periodic audits,

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SLA/OLA (Sample)

Service Levels					
Section	**Parameter**	**Response/ Resolution Time**	**Expected Service Level**	**Minimum Service Level**	**Measurement Period**
App Maintenance	Priority Level 1 Service Levels	30 Mins/ 4 Hours	95.00%	90.00%	Monthly
	Priority Level 2 Service Levels	60 Mins/9 Hours	95.00%	85.00%	Monthly
	Priority Level 3 Service Levels	2 Hours/ 24 Hours	95.00%	85.00%	Monthly
	Priority Level 4 Service Levels	4 Hours/ 72 Hours	95.00%	85.00%	Monthly
	Application Availability - Mission Critical (Tier 1)		99.90%	99.70%	Monthly
	Application Availability -Business Critical (Tier 2)		99.81%	99.54%	Monthly
	Application Availability -Significant (Tier 3)		99.40%	98.50%	Monthly
	Application Availability -Important (Tier 4)		97.90%	90.00%	Monthly
	Enhancements Implemented On-Time		95.20%	91.00%	Monthly

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Support Model: Communication (cont…)

Communication Plan

- Engagement with business upfront on communication expectations
- Various activities and tasks identified for applications and communication plan prepared and finalized
- Prepared by, Reviewed by, Sent by, Sent to, follow ups and so on.
- We can always do better

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Support Model: Communication (Sample) (cont…)

Sr. No.	Activity/Task	Application	Communication					
			Prepared By	Reviewed By	Sent By	Sent to	SP Links	Remarks
2	Outage(Planned/Unplanned)	SAP	O&M	Business	O&M	End-Users	Link	Editor
		Documentum	O&M	Business	O&M	End-Users		Editor/Web
		OSB	O&M	Business	O&M	End-Users		Editor
		GDGIS	O&M	Business	O&M	End-Users		
3	Releases	GD GIS Editor	O&M	Business			Link	Only for O&M and Minor Enhancements
	Communication before and after	GD GIS Mobile	O&M	Business				
		GD GIS Viewer	O&M	Business				
		Landbase	O&M	Business				
4	Releases Notes : IT	GD GIS Editor	O&M				Link	Not to be sent to the Users, For IT Deliverables
		GD GIS Viewer	O&M					
		Landbase	O&M					

Minor Enhancements

Scope/Expectations

- Deliver 5000 hours of minor enhancements in one quarter. (1250 hours for each tower)
- The hours decrease as year go by…
- Requirements gathering onsite; Offshore development
- Quarterly releases
- Full SDLC cycle

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Keeping Data Upto date

- Ensure that the landbase data is latest and greatest
- Updated data from 2012 to 2017
- Build a process around this
- Using AGOL Geocoder on as need basis

Internal

Performance Monitoring and Disaster Recovery

- Esri System Monitor now called ArcGIS Monitor
  - Performance Monitoring and Tuning
  - End to End monitoring
- Disaster Recovery
  - Twice a year
  - RTO (Recovery Time Objective) and RPO (Recovery Point Objective)

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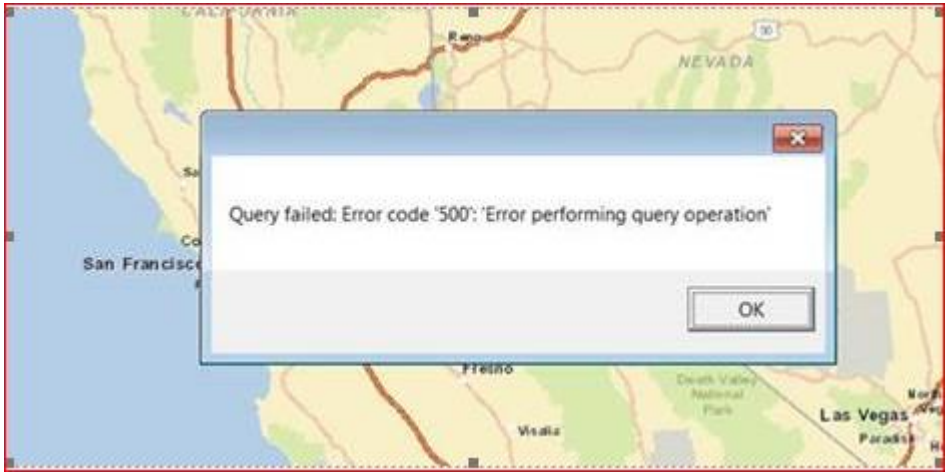
Case Study: Performance Monitoring

Problem Statement

- EDGIS WebViewer does not load
- EDGIS WebViewer throws error



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Case Study: Performance Monitoring (cont…)

Analysis

- One of the foundational map service appears to be running out of bandwidth (instances)
- There are already 10*10 = 100 ArcSOC available and even they are running short
- Look into why so many ArcSOCs are being used?
- Add more ArcSOCs?

Category ArcGIS, type Services, source AdminAPI, time Timespan, stat name Response Time(sec)

ID	Collection	Site	SiteUrl	Cluster	folder	Service	ServiceType	TrSum	Min(sec)	Avg(sec)	p5(sec)	p50(sec)	p75(sec)	p95(sec)	p99(
1	EDGISPROD	DC2 WEBR	http://edgisapi	default	Data	ElectricDistribu	MapServer	11669	0	92.3	0	0.92	8.9	708.76	
2	EDGISPROD	DC2 WEBR	http://edgisapi	default	Data	ElectricDistribu	MapServer	269	0	75.39	0	0.45	1.67	339.97	
3	EDGISPROD	DC2 WEBR	http://edgisapi	default	Data	CircuitMap_50	MapServer	190	0	59.1	0	0.03	3.95	307.44	
4	EDGISPROD	DC2 WEBR	http://edgisapi	default	Data	EDMaster	MapServer	302	0	68.66	0	0.69	2.5	285.79	
5	EDGISPROD	DC2 WEBR	http://edgisapi	default	Data	AssessmentMa	MapServer	174	0	16.18	0	0.01	0.47	68.17	

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Case Study: Performance Monitoring (cont…)

Solution and Monitoring

- Added more ArcSOCs in short term
- For long term, MXD tuning, working on migrating Silverlight viewer to JavaScript viewer (possibly also an offline viewer)

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Case Study: Performance Monitoring (cont…)

From

Category ArcGIS, type Services, source AdminAPI, time Timespan, stat name Response Time(sec)

ID	Collection	Site	SiteUrl	Cluster	folder	Service	ServiceType	TrSum	Min(sec)	Avg(sec)	p5(sec)	p50(sec)	p75(sec)	p95(sec)	p99(
1	EDGISPROD	DC2 WEBR	http://edgisapj	default	Data	ElectricDistribu	MapServer	11669	0	92.3	0	0.92	8.9	708.76	
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To

time Timespan, stat name Response Time(sec)

Cluster	folder	Service	ServiceType	TrSum	Min(sec)	Avg(sec)	p5(sec)	p50(sec)	p75(sec)	p95(sec)	p99
default	Data	CircuitMap_50	MapServer	6601	0	13.31	0	0.03	0.99	41.57	
default	Data	CircuitMap	MapServer	12481	0	9.95	0	0.04	0.98	37.75	
default	Data	ElectricDistribu	MapServer	15953	0	9.59	0	0.47	1.46	34.56	
default	Data	EDMaster	MapServer	52298	0	19.89	0	0.68	1.79	34.53	
default	Data	Publication	MapServer	36223	0	10.26	0	0.05	0.11	28.79	
default	Data	UFM_50	MapServer	5340	0	5.84	0	0.02	0.22	26.61	
default	Data	RuralMapView	MapServer	10865	0	9.28	0	0.28	1.35	26.57	
default	Data	Secondary_50	MapServer	5085	0	6.13	0	0.02	0.27	26.46	
default	Data	Primary_50	MapServer	6611	0	5.6	0	0.03	0.59	24.24	
default	Data	Schematics	MapServer	15845	0	7.4	0	0.25	1.79	22.47	
default	EDGIS	CommonLandb	MapServer	221349	0	4.39	0.47	0.76	1.97	21.98	
default	Data	Substation	MapServer	6808	0	11.07	0	0.02	0.8	20.71	

GISOPS during disasters

- We have to operate as if disaster is around the corner. Always keep the lights on and the gas flowing
- Tomorrow @9:10 in Trinity Ballroom 3

Trinity Ballroom 3	9:10 am - 9:45 am	Responding to New Normal Wildfires	Potriadian Subramanian (PG&E)

Internal

Future

- Managing Performance, Capacity and Utilization
- Agile Projects
- DevOps
- Lifecycle upgrades and improvements
- Capital v/s Expense
- Utility Network?

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Thanks

- Questions?
- Vishal.Pahuja@pge.com (v1p3@pge.com)

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