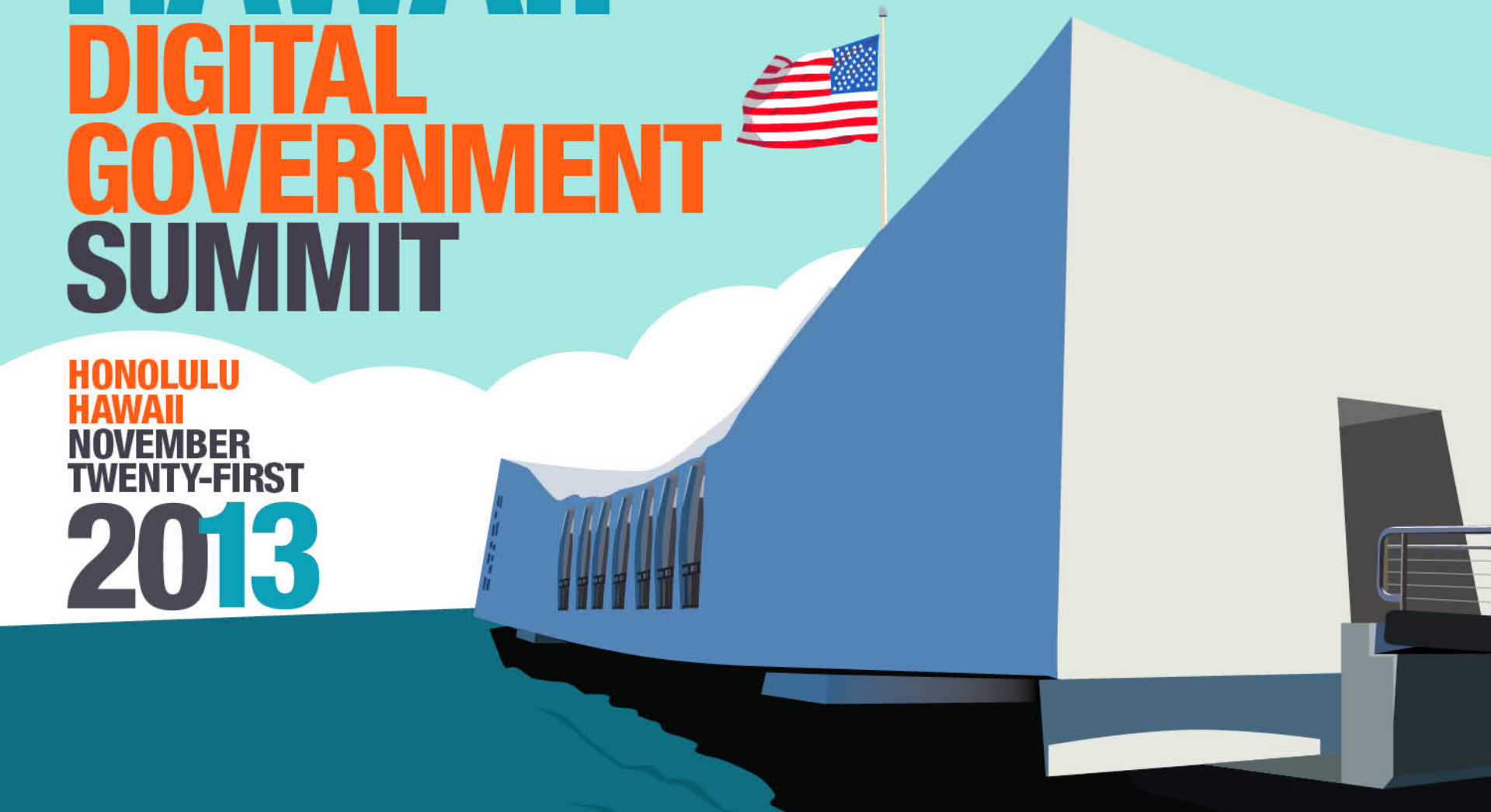
GOVERNMENT TECHNOLOGY®

HAWAII DIGITAL GOVERNMENT SUMMIT

HONOLULU
HAWAII
NOVEMBER
TWENTY-FIRST
2013



- **T1: Implementing a Reliable Infrastructure Environment**

- **"Operational Excellence"**
  - Creating a world-class technology environment that is highly available, resilient, and scalable with a Service Level Guarantee of 99.9% availability.
  - Supporting Continuity of Government Services

- **State Transformation Plan**
  - Technology Modernization Track
    - Consolidated Infrastructure
    - Enterprise Shared Services

- **Session Focus**
  - What will the future bring to our data center and its interfaces? As we continue to upgrade the infrastructure, what new technologies should be considered? This session takes a look at the technologies that will lead the way including what is the future of the Consolidated Infrastructure, Advanced Computing Environment, Data Centers and what exciting new trends are coming in virtualization, mobility, storage, cloud computing, green technology, maintenance, cost control and overall security.

- **Agenda**
  - Presentations by Panelists
  - Facilitated Q & A

Sharon Wong - Acting Administrator, Information and Communication Services Division, Department of Accounting and General Services, State of Hawaii

Shaun Sweeney - Regional IT Lead, Cisco

David Wu - Chief Information Officer, Department of Education, State of Hawaii

Keone Kali - Deputy Chief Information Officer - Operations, State of Hawaii

- **T1: Implementing a Reliable Infrastructure Environment**

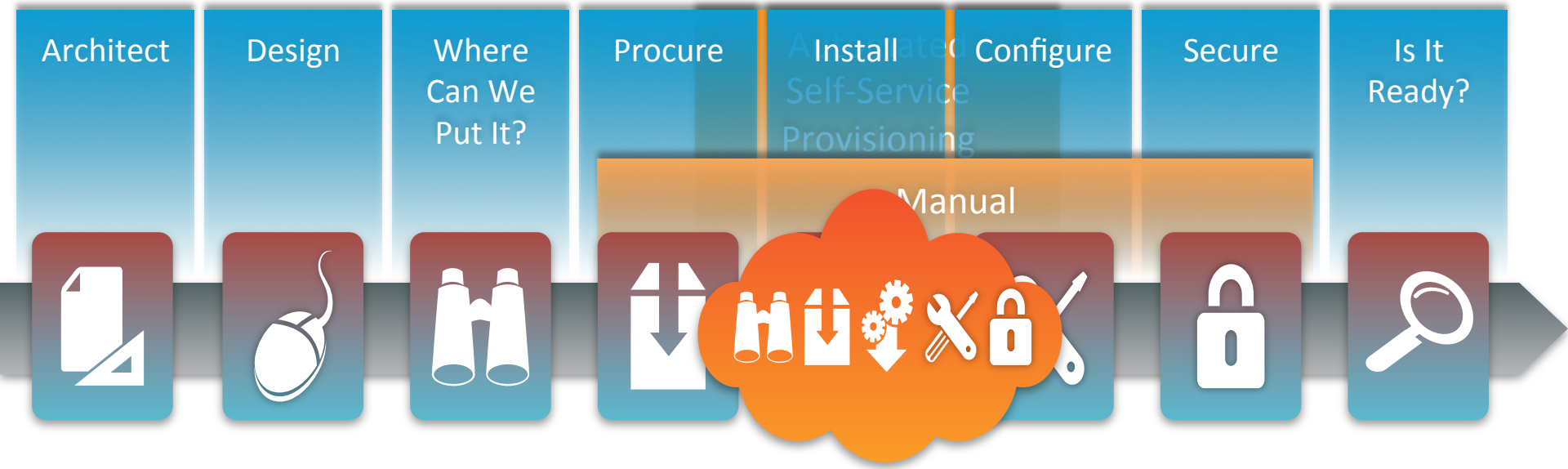
- **Problem Statement**
  - Cisco IT wanted to increase the company's business agility by automating the ordering and provisioning of IT infrastructure and making it available as a standardized, cost-effective service.

- **Alignment with State Transformation Plan**
  - Technology Transformation
    - Enterprise Resource Planning (ERP)
    - Shared Services Center

- **CITEIS**
  - Cisco IT Elastic Infrastructure Service
- **Cisco on Cisco**
  - Utilize Cisco's product offerings to deliver best in class services to our internal users
    - Unified Fabric
    - Unified Computing
    - Unified Management

Cisco IT Journey: Automated Self-Service Provisioning

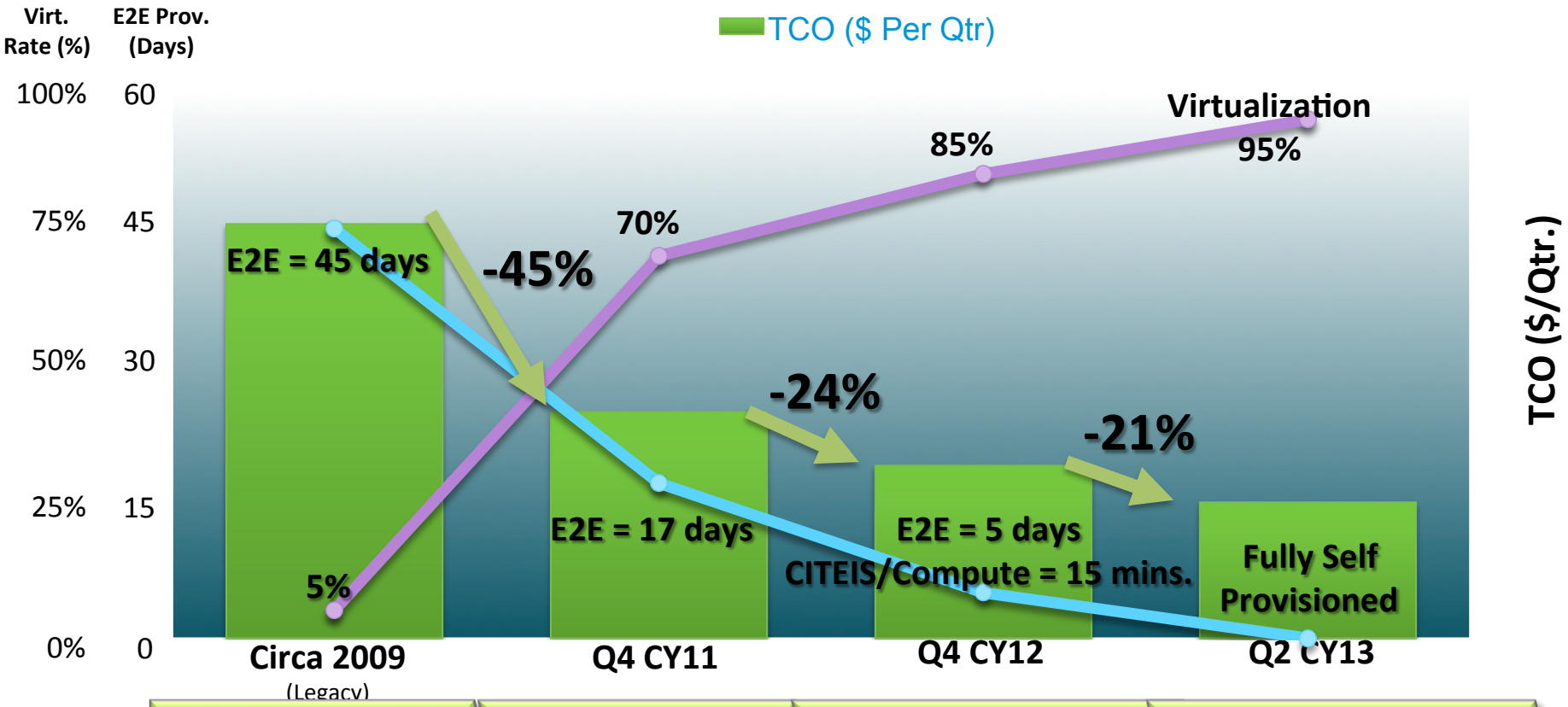
FROM 8 WEEKS TO 15 MINUTES



- Capacity On-Demand
- Policy-Based Provisioning
- Built-In Governance

T1: Implementing a Reliable Infrastructure Environment

Data Center Transformation – Infrastructure TCO Over the Years



Legacy Bare Metals based Data Center	Focus	Focus	Focus
	• UCS Adoption • All Virtualization on UCS	• Workflow automation • PaaS Enablement • Storage Optimization	• Process Transformation • Infrastructure/ Platform Optimization

T1: Implementing a Reliable Infrastructure Environment

Source: Cisco IT GIS–September 2012

- **Key Accomplishments**
  - 170,000 CITEIS requests provisioned in a little more than two years
  - CITEIS users can order the service through an easy web portal
  - 90 percent of virtual machines provisioned by users are self-managed, which reduces the support burden on Cisco IT
  - CITEIS eliminates reasons for users to turn to external cloud services, with their associated costs and security risks

- **Summary**
  - Architecture, Architecture, Architecture
  - Virtualize
  - Standardize
  - Automate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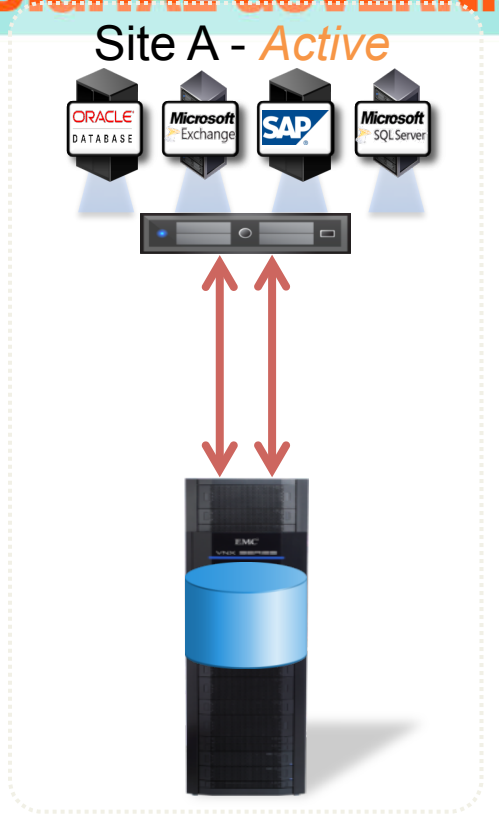
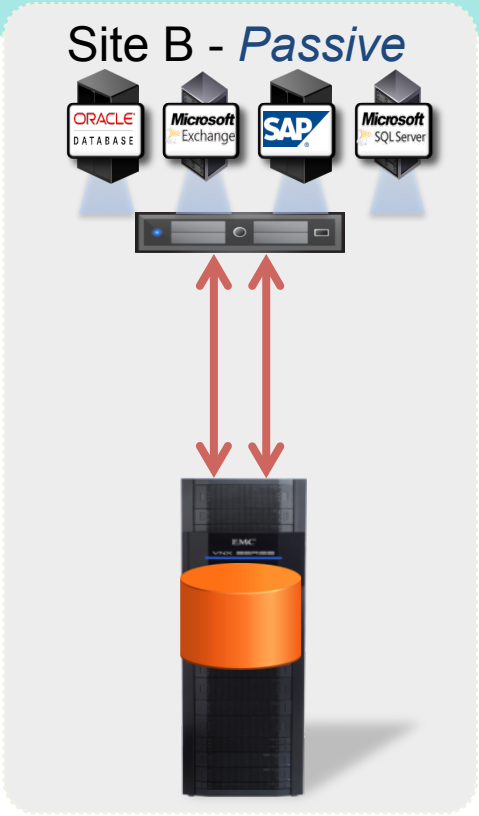


DOE Now Active-Passive Site

MOST of the data on disaster recovery site is used on failure
(Outage to move applications)

Other Common Approaches

Server Clusters
Host Mirroring
Remote Replication

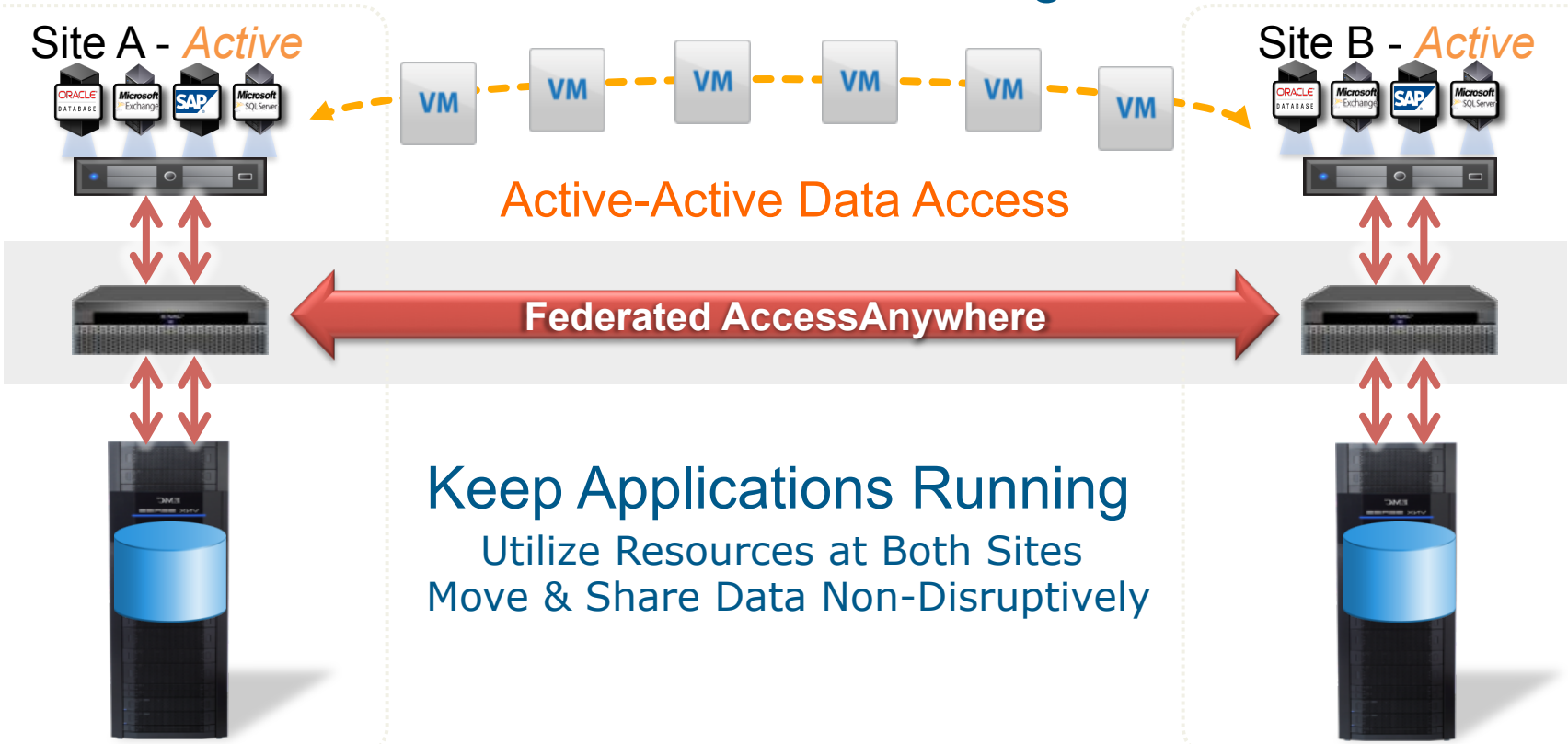


Traditional challenges

- Server cycles required to mirror or cluster
- Application restart required after failover
- Remote replication RTO/RPO impact
- Network routing and different L2/L3 per site
- *Pay for expensive DR equipment that isn't used*

Source: World Wide Technology Oct 2013

DOE Future RAD Design



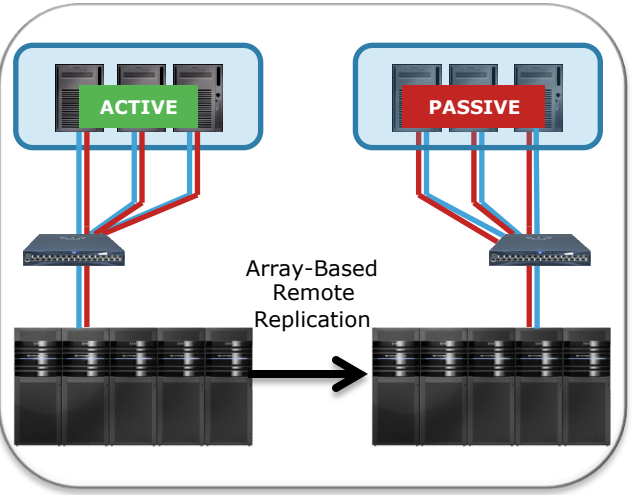
"RAD" Advantages

- → Enables stretched clusters with zero RPO
- → Automated recovery with near-zero RTO
- → High availability within and across VPLEX Metro data centers
- → *MOST importantly DR equipment is used*

Source: World Wide Technology Oct 2013

Example of RAD Value– Evolution of Oracle Storage toward VPLEX Design

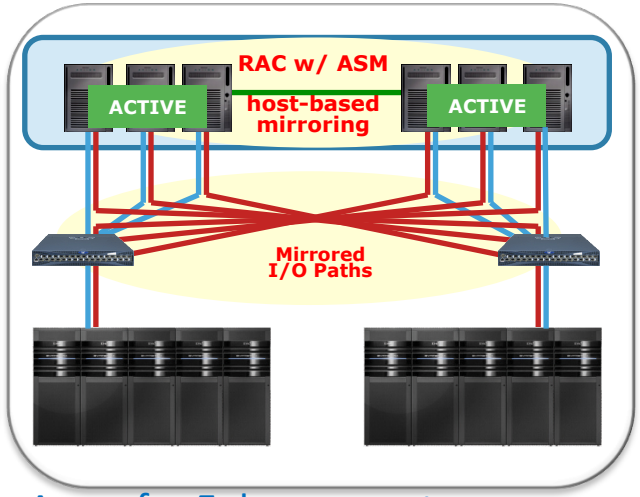
Typical configuration:
Oracle RAC with array-based replication for disaster recovery



Areas for Enhancement

- Requires full failover and *restart* at remote site
- Recovery time objective (RTO) is long
- Complex DR testing

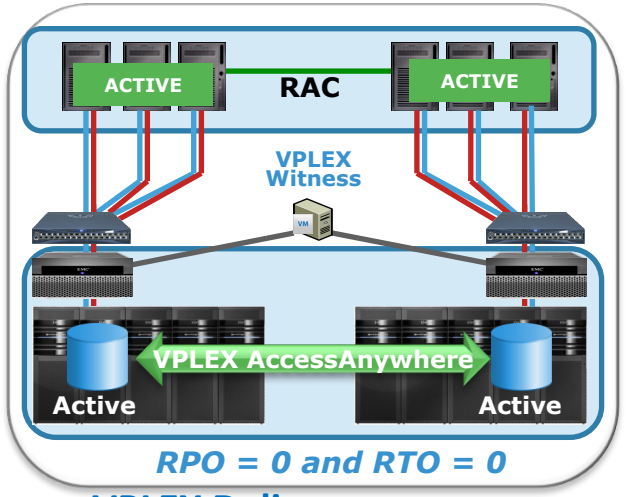
Typical configuration:
Oracle RAC over distance with Oracle ASM (Host-Based Mirroring)



Areas for Enhancement

- Valuable CPU cycles spent on host mirroring
- Error-prone management of host mirroring, groups, paths
- Complex cross-connect SAN networking

VPLEX configuration:
VPLEX simplifies deployment of Oracle RAC over distance



VPLEX Delivers:

- High availability
- Configuration & Management *SIMPLICITY*
- High-performance replication (no server CPU cycles)

**** Requires Oracle Cloud File System License ****

Source: World Wide Technology Oct 2013

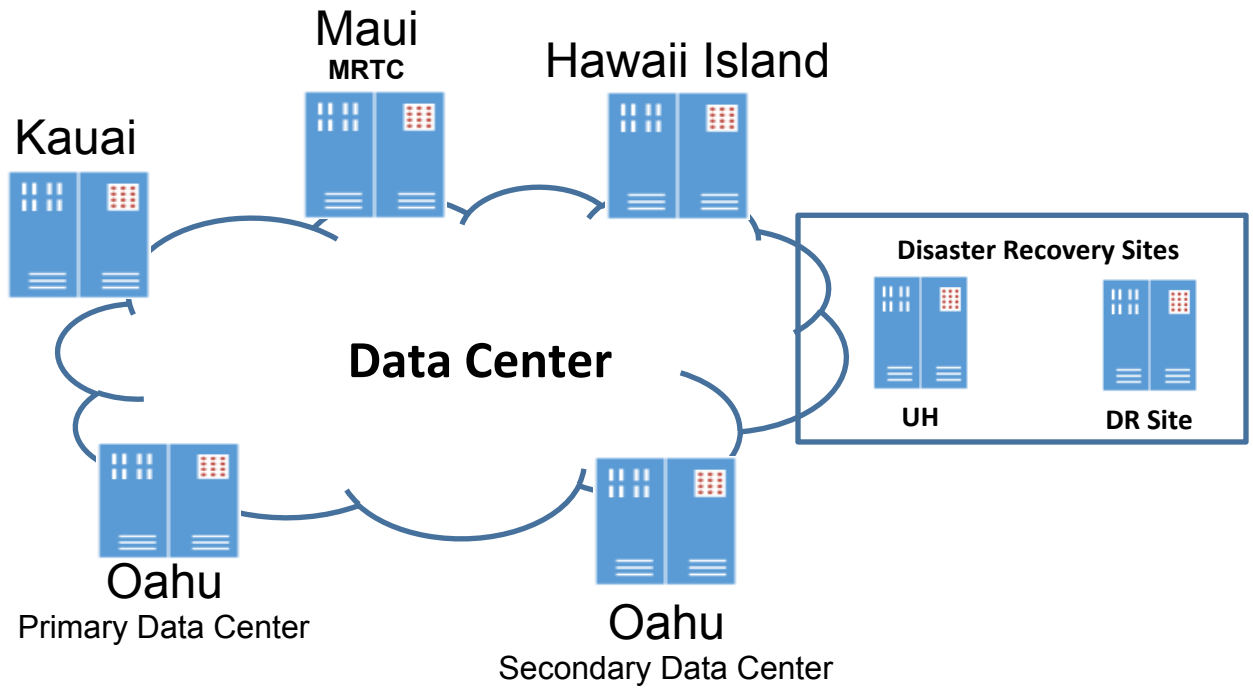
Consolidated Infrastructure

10Gbps Backbone Network

Unified Communications

Internet Services

OIMT Data Center Strategy



Legacy Network\Data Center

Legacy Network Center

Long Range Migration Strategy

Switched Ethernet (EIPDS)

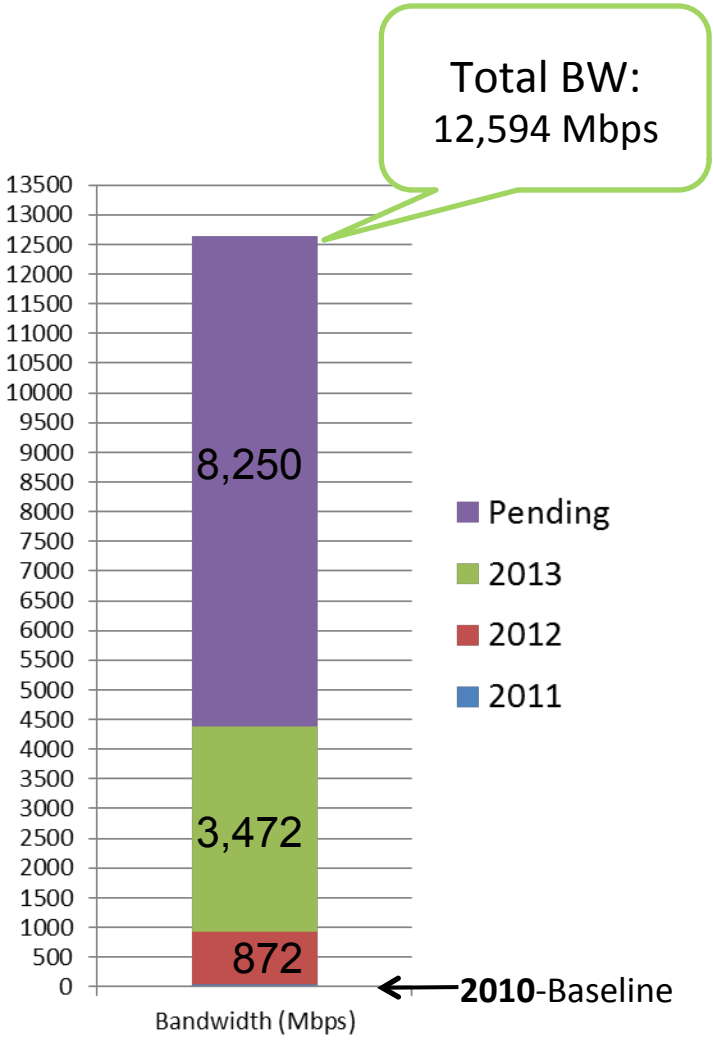
Statewide Back Up

RESULTS

- Developed Statewide Back Up to SoH INET
- Connects existing Data Centers and State Office Buildings

BENEFITS

- **Availability**: Highest availability via MPLS technology
- **Reliability:** Hawaiian Telcom's SLO: 99.99% vs. State's SLO: 99.9%
- **Scalability**: Provides incremental growth via Ethernet
- **Affordability**: MegaBit Per Second prices get lower as the circuit size increases



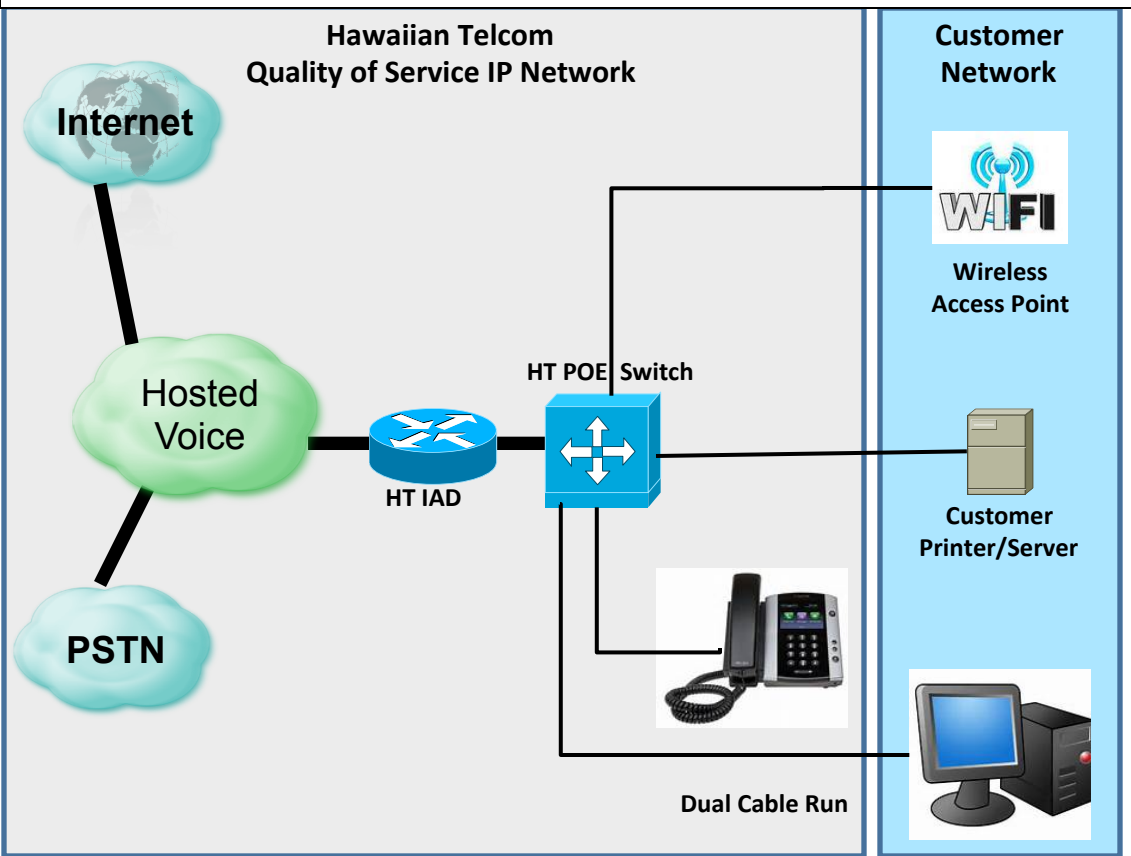
Hosted Voice

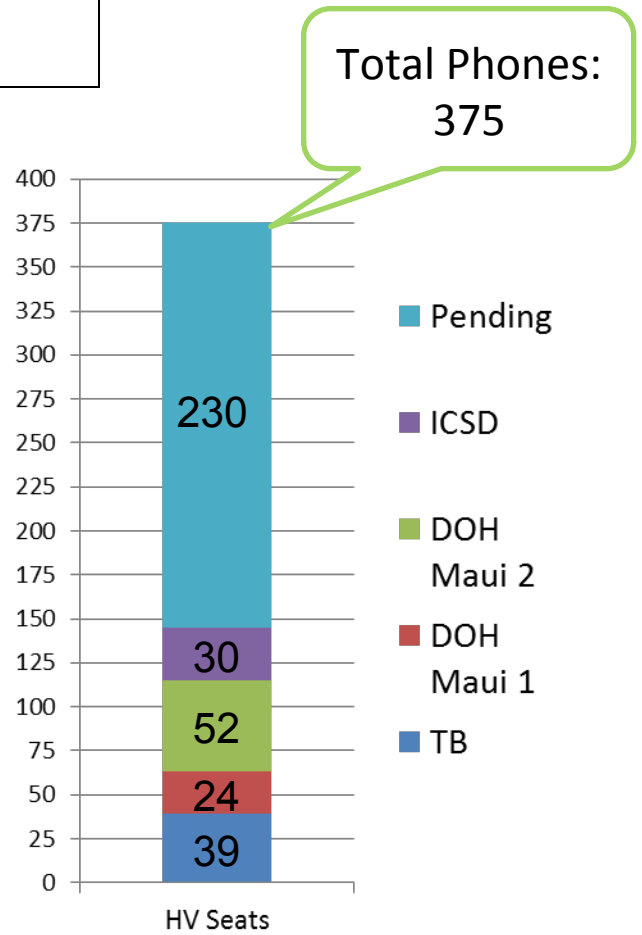
RESULTS

- No change in telephone numbers / Preserves 5-digit SoH dialing services
- CAT6 dual cable run standard for all State Office Buildings

BENEFITS

Disaster Recovery: Automatic failover to another number
UC Technology Update: Integration of phone, email, & mobile phone, IM/presence, etc.
Mobility: Transfer calls between desk phone and cellphone (twinning)
Hosted Service: NoC monitoring, less power consumption, automatic software upgrades
SLO: 2 Business hours for Oahu, 4 Business hours for Kauai, Maui & Big Island
Cat6 Cabling: Establishes bandwidth capabilities up to 10 Gbps





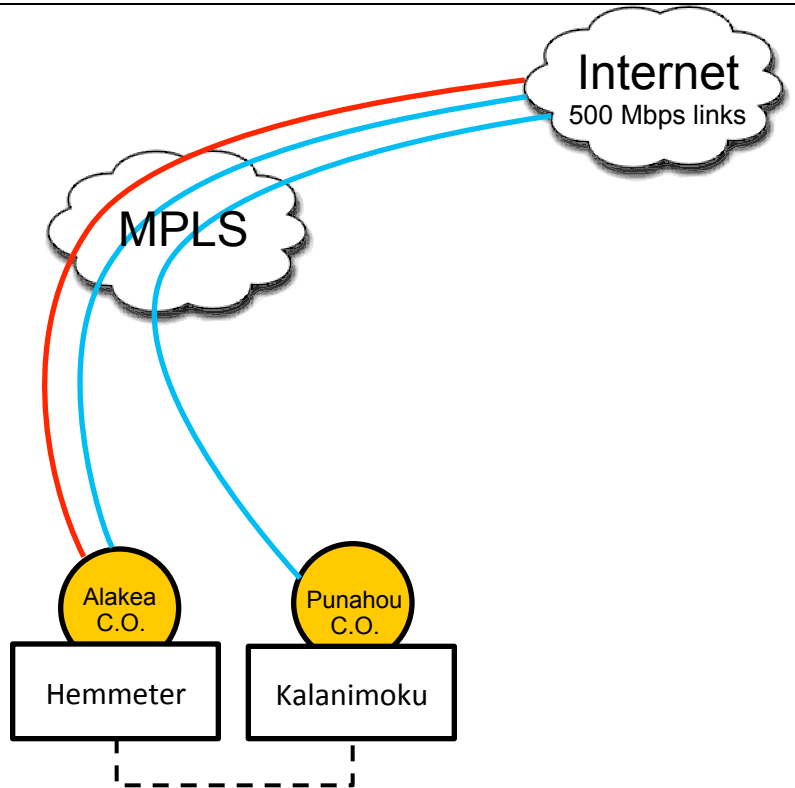
Dedicated Internet Access

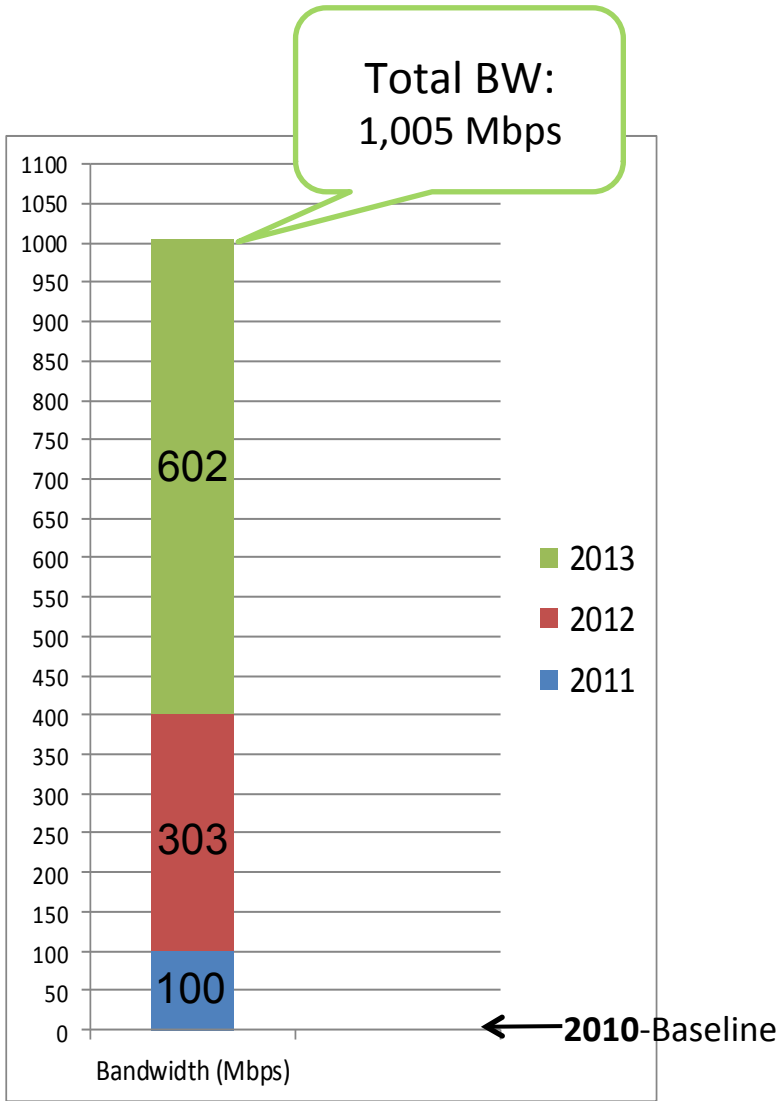
RESULTS

- Migrated from one stand alone circuit to multiple circuits
- Lowers overall network costs to the SoH
- Increases performance and redundancy

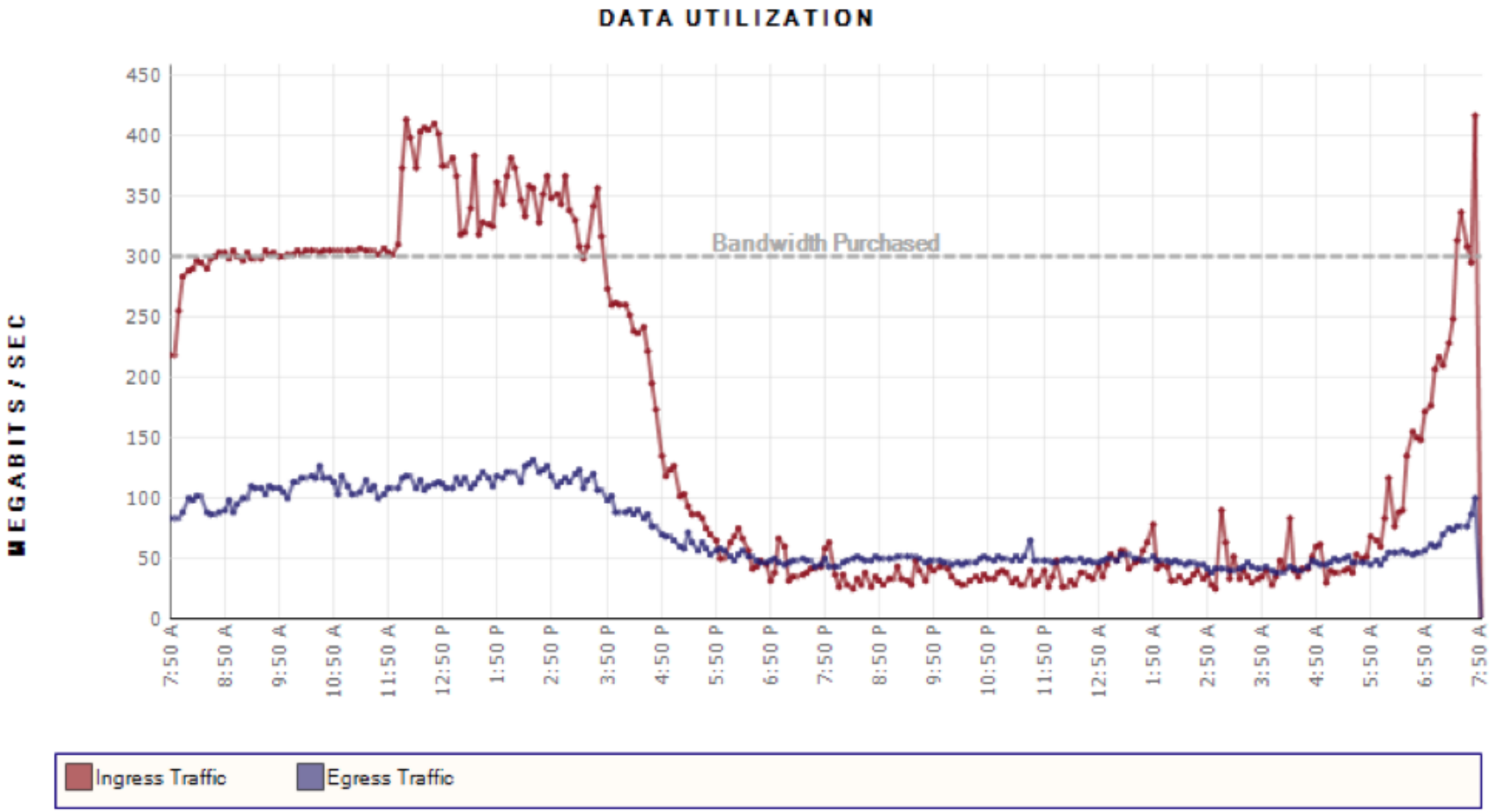
BENEFITS

- **Availability**: Highest availability via MPLS technology
- **Reliability**: Designed with off island redundancy;
  BGP failover configurations to be developed to ensure availability
  Hawaiian Telcom SLA: 99.97% vs. State SLA: 99.9%
- **Scalability**: Provides incremental growth via Ethernet
- **Affordability**: MegaBit Per Second prices get lower as the circuit size increases





Current Internet Bandwidth Utilization 300Mbps - 500Mbps



Consolidated Infrastructure

Network Managed Services

Security Managed Services

Network and Security Operations Center (NSOC)

- Global Monitoring
- All IT Assets
- All Ingress/Egress Points
- All Network Nodes

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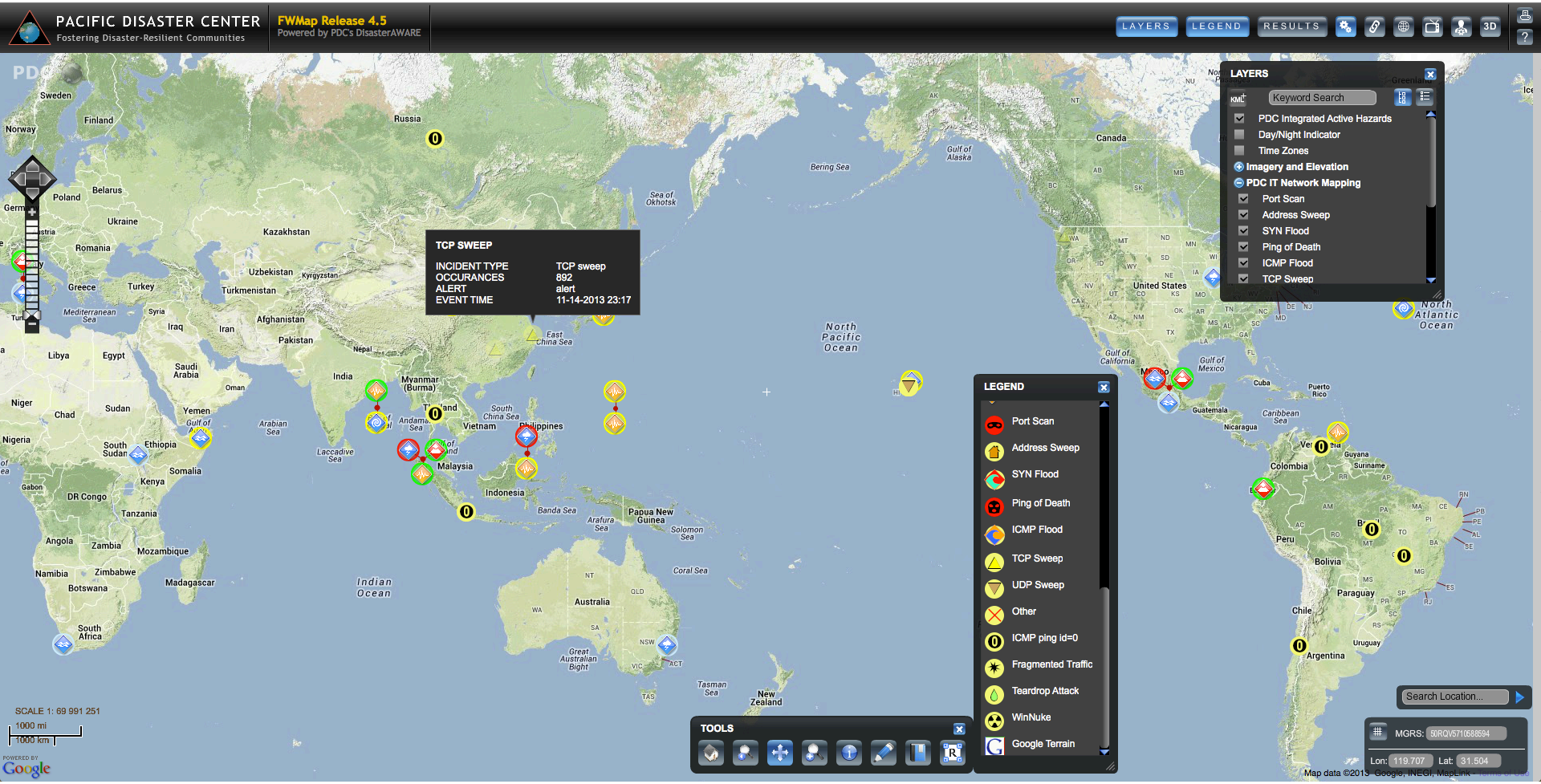
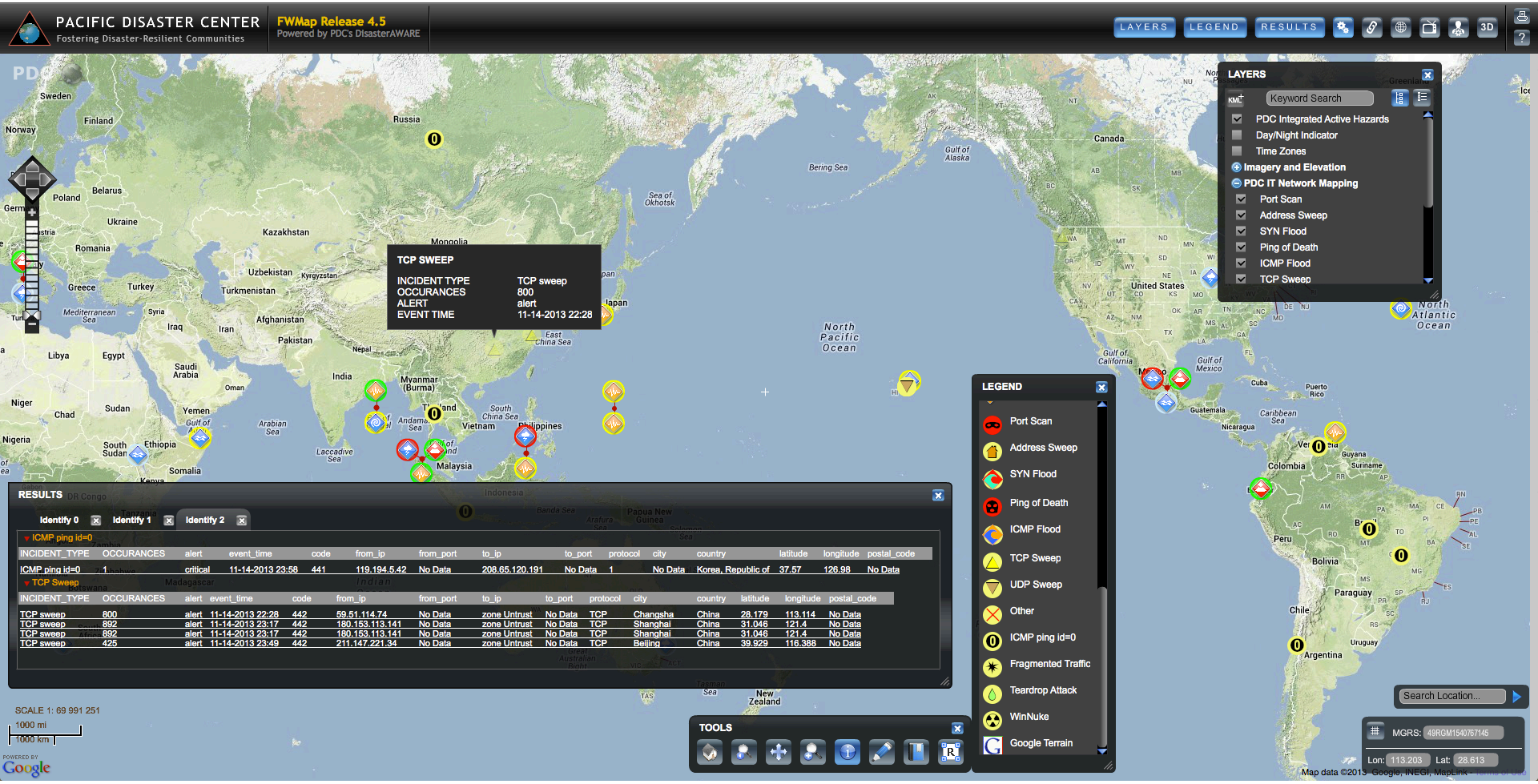
- Critical Infrastructure Protection
- Cyber Hazard Monitoring
- Natural Hazard Monitoring
- Man-Made Hazard Monitoring



- Detailed IP Security Forensics
- Near Real-Time Response and Mitigation



- Video Surveillance

Consolidated Infrastructure

Data Center Managed Services

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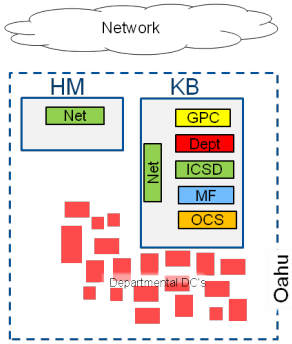
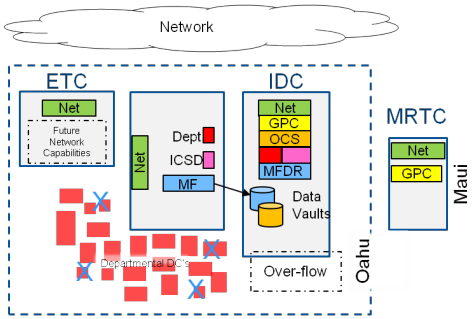
State of Hawaii's Long Term Data Center Journey

Current State



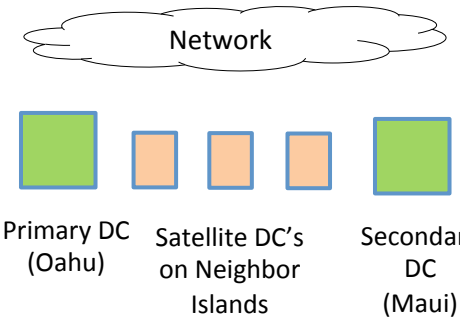
- State IT assets spread across 27+ departmental and ICSD data centers on Oahu
- Primary state data center at Kalanimoku houses many critical applications
  - Decaying DC infrastructure susceptible to outages
  - Limited expansion capability; current data center is almost "full"
  - Vulnerable to natural disasters (fire, flooding, etc.)
- Limited and inadequate disaster recovery capability for major applications housed at Kalianimoku
- Loss of Kalanimoku data center could cause state backbone network failure affecting all departments and sites

Short Term- Future State (2-3 years)



- Interim Data Center (IDC)established at a world class, co-location facility on Oahu
  - Reliable, Tier 3 DC infrastructure
  - Sufficient capacity to support new applications/ workloads and some departmental consolidation
  - All critical state applications except those on the mainframe migrated to this facility
- Kalanimoku Dependency significantly reduced
  - KB role reduced to mainframe data center, print center and server room for legacy, non-critical applications
- Disaster Recovery (DR) and failover capabilities established for new and existing applications .
  - Real-time Data Vaulting of all legacy applications housed at KB established at IDC
  - Failover for Unix and Windows applications provided through GPC infrastructure on Maui
  - Mainframe "warm site" disaster recovery capability established in this facility

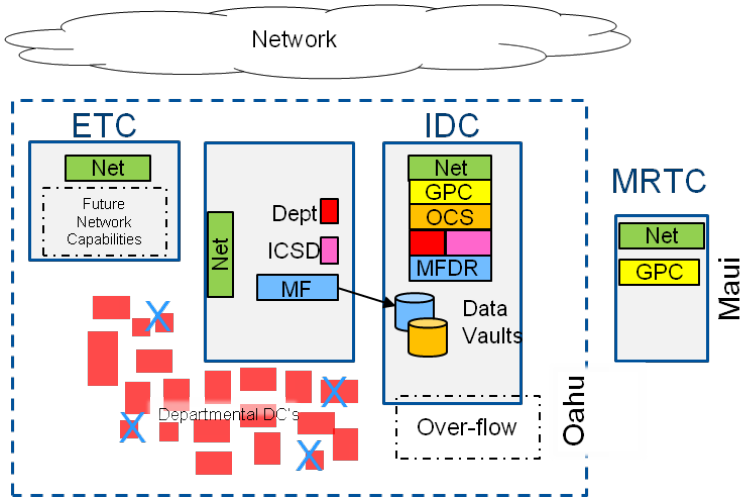
Long Term- Future State (4-5 years)



- Most existing State or departmental data centers retired as part of an overall consolidation program.
- Most State system housed in highly robust Tier 3 data center located away from likely disaster zones.
- Full DR capability for all critical State systems housed in a separate Tier 2 data center on Maui or Oahu
- Satellite data centers established on Neighboring Islands to support island-centric computing needs.

ETC- Enterprise Telecom Center
KB- Kalanimoku Data Center
HM- Hemeter Building
\IDC- Interim Data Center
MRTC- Maui Research & Tech Center
GPC- Government Private Cloud
NET- Core State Network Node
OCS- Other Crticial Systems (Unix)

Short-Term Future State: Six Key Aspects



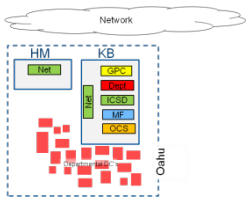
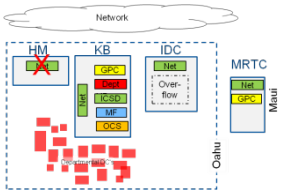
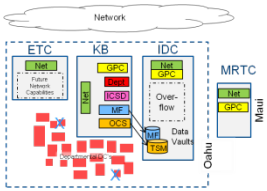
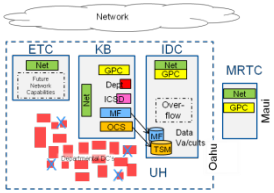
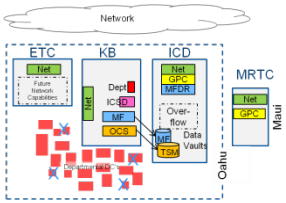
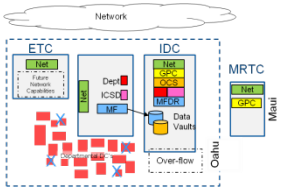
Note: UH is not depicted here as it would be a telecom center only. Initially, this would be a minimal footprint, perhaps including of the Sate' Internet connections. This role will be more important once the Oahu INET ring is split.

Legacy Departmental X86 Servers
Legacy ICSD X86 Servers
Major Telecom Nodes
Enterprise Unix Systems

ETC- Enterprise Telecom Center
KB- Kalanimoku Data Center
HM- Hemeter Building
\IDC- Interim Data Center
MRTC- Maui Research & Tech Center
GPC- Government Private Cloud
NET- Core State Network Node
OCS- Other Crticial Systems (Unix)

1. Major statewide network node at Hemmeter is migrated to the ETC which will be located at major co-location center on Oahu.
2. Primary State data center is the Interim Data Center (IDC) at a major co-location center on Oahu. All future systems to be located here.
3. Disaster recovery capabilities are provided through a data vault located at the IDF for legacy mainframe systems remaining at KB and at the State's primary Disaster Recovery site at the MRTC on Maui for all other systems
4. Kalanimoku remains the State's primary data center for Mainframe Systems and a primary network location (but fully redundant with the IDC) . It also remains print center, staff location (help desk, etc.) and legacy server room.
5. Most x86 servers at KB are migrated to the government private cloud (GPC) infrastructure which located at the IDC and the MRTC.
6. Critical Unix systems are migrated to the IDC as part of their hardware refresh process.

Short-Term Strategy Implementation

Dec 2013	March 2014	June 2014	Sept 2014	Dec 2014	June 2015
"Open For Cloud"	*"Basic Redundancy and Capacity"*	*"Basic DR Functions"*	*"Virtualize Servers"*	*"MF DR and Advanced Cloud*	*"KB Stabilized"*
					
Major Changes					
	✓ GPC fail-over on Maui available ✓ Core network node at Hemeter moved to a Tier 3 facility ✓ Overflow data center capacity available at IDC	✓ Critical systems data stored in the IDC ✓ P2V capability available ✓ Structured program to virtualize existing KB and department DC servers launched ✓ GPC node constructed at IDC	✓ 30-40% of KB servers virtualized ✓ Some GPC processing shifted to IDC	✓ 50-60% of KB servers virtualized ✓ GPC moved from KB to IDC; ✓ Self-service provisioning for non-critical workloads ✓ Backup Mainframe established at IDC	✓ Enterprise Unix systems moved to IDC ✓ KB High Priority Deferred Maintenance Items Addressed ✓ KB continues as Mainframe DC and Print Center.

Key Benefits

Capacity

- New Workloads on GPC
- Overflow data center space available for new applications and servers
- Virtualization relieves pressure on KB
- Ready for dept. DC consolidation pilot
- Ready for full scale dept DC consolidations
- Ready for new enterprise systems

Risk Reduction

- Core Network node redundancy
- Critical system data in data vault at IDC
- Servers move to reliable private cloud
- Backup Mainframe
- KB Deferred Maintenance Complete

Enterprise Shared Services

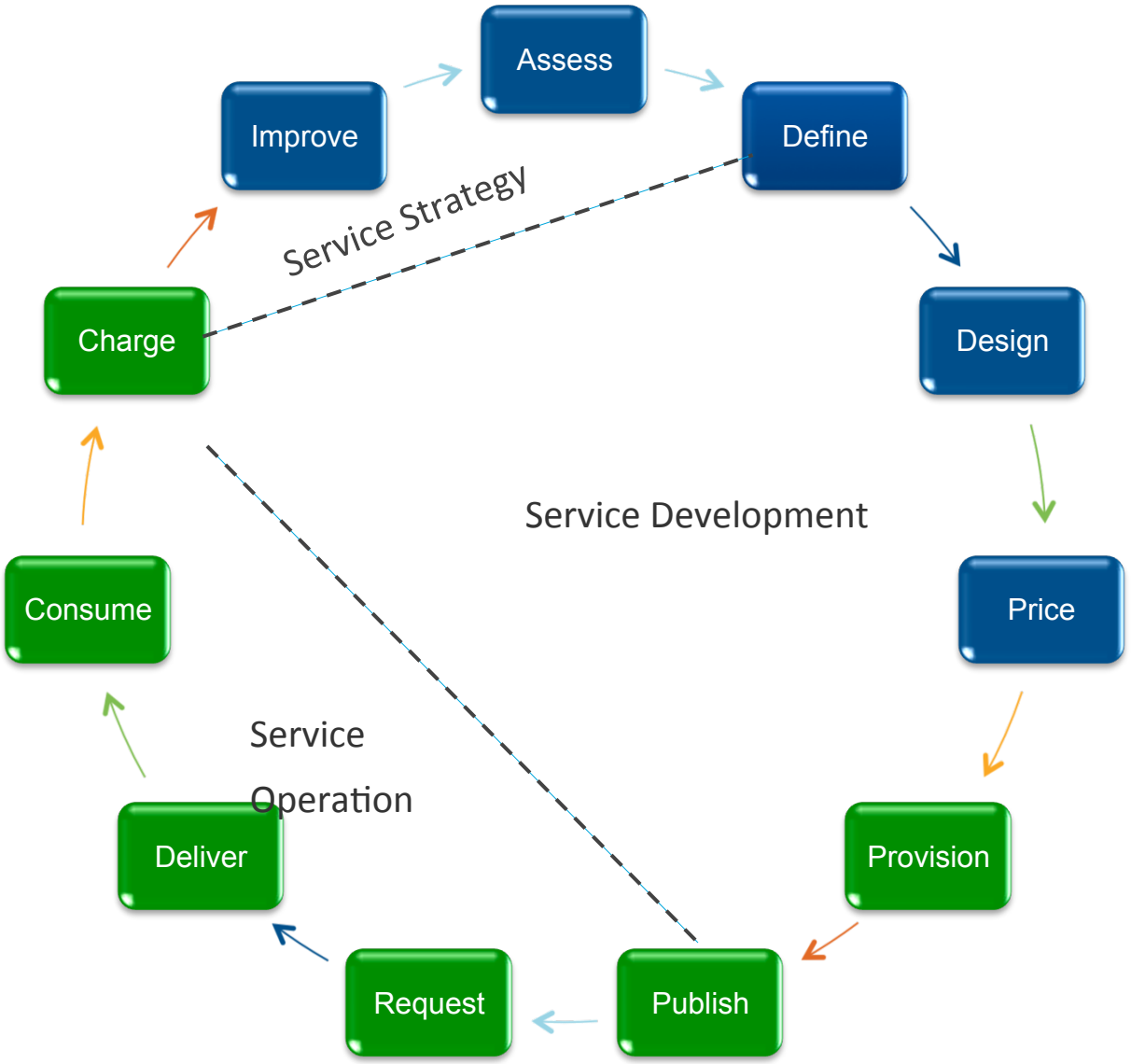
Government Private Cloud Services (GPC)

Virtual Desktop Infrastructure (VDI)

Geospatial Information Systems (GIS)

Enterprise License Agreements

Service Lifecycle

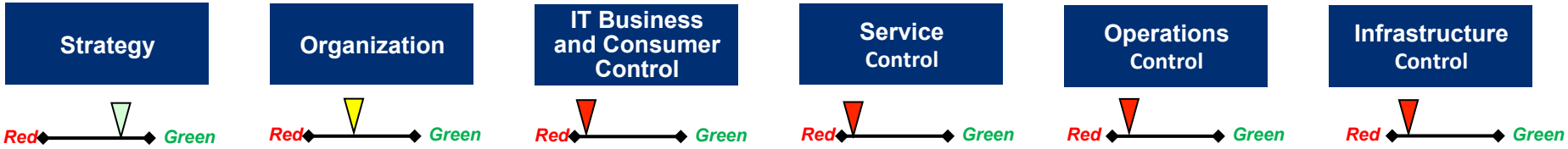


- Accelerate Transformation Services leverage ITIL v. 3 to define a service as “A means of delivering value to the Customers by facilitating outcomes the Customers want to achieve clear ownership; reduction of specific Costs and mitigation of Risks”.
- Accelerate Transformation Services build and align the service life-cycle with core areas of people, process, and technology to align with business needs.
- Accelerate Transformation Services build executable processes aligned to VMware Products to accelerate Customer value.

Drivers:

- State of Hawaii Innovation Economy initiative
- Data center consolidation, scattered “IT” brought together
- Economies of Scale
- Enterprise Shared Services
- Network / Technology Upgrade and Stability – 99.9% uptime goal
- Security 60+ projects under way
- Network 50+ projects under way

- Virtualization Initiatives:
  - Operational Capability Assessment
    - Assessment completed
    - Recommendations & roadmap delivered



  - Private cloud technology implementation
    - Hardware & software configured
    - Self-service selection(s) via portal
    - Automated infrastructure deployable < 5 minutes

New Operating Model for the Cloud Era

Reactive
"Standardize"

Proactive
"Service Broker"

Innovative
"Strategic Partner"

IT Business Management

People, Culture & Organization

Processes & Control

Software Technology & Architecture

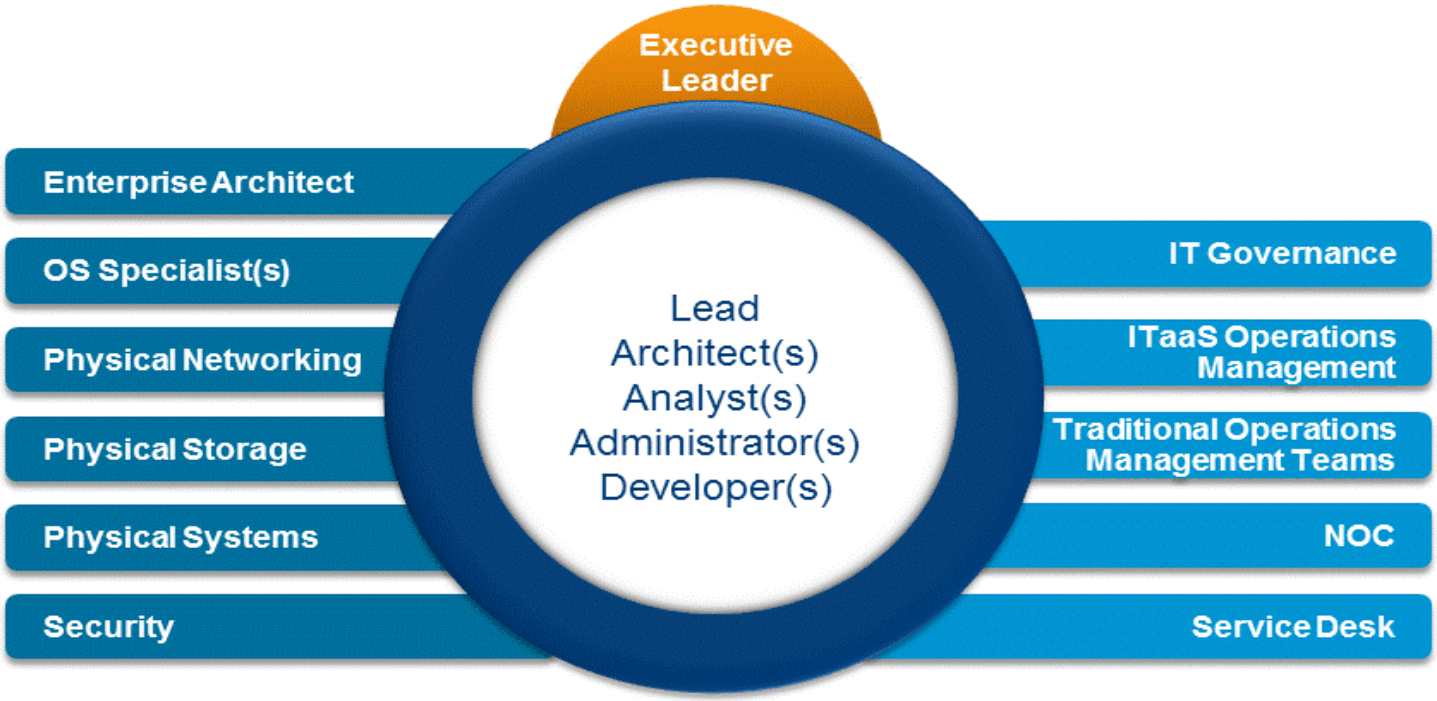
HOW DO I OPERATIONALIZE CLOUD SERVICES?

Cloud Ops

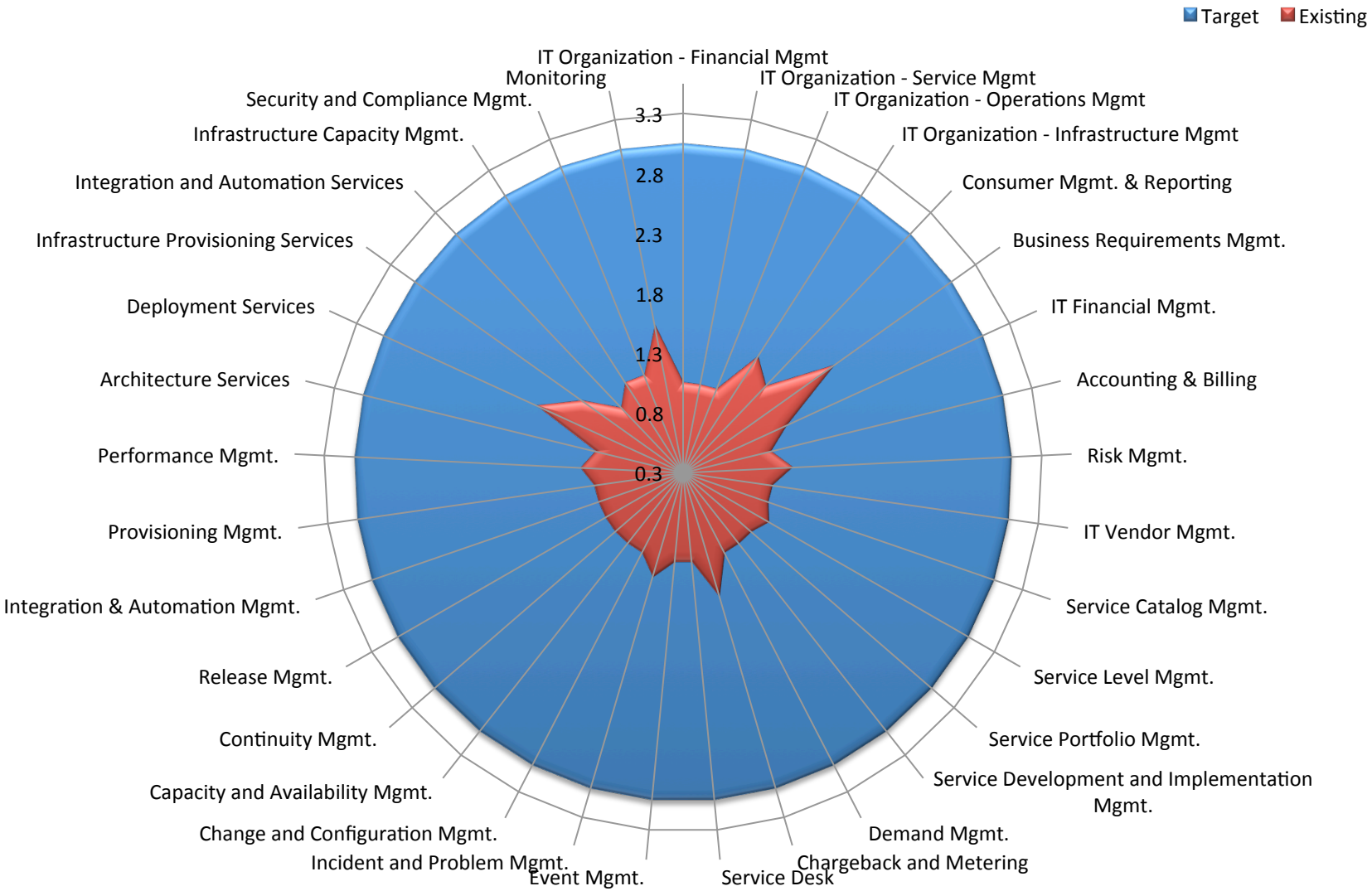
HOW DO I MAKE THE TECHNOLOGY MEET THE BUSINESS NEED?

Cloud Operations Leadership Team

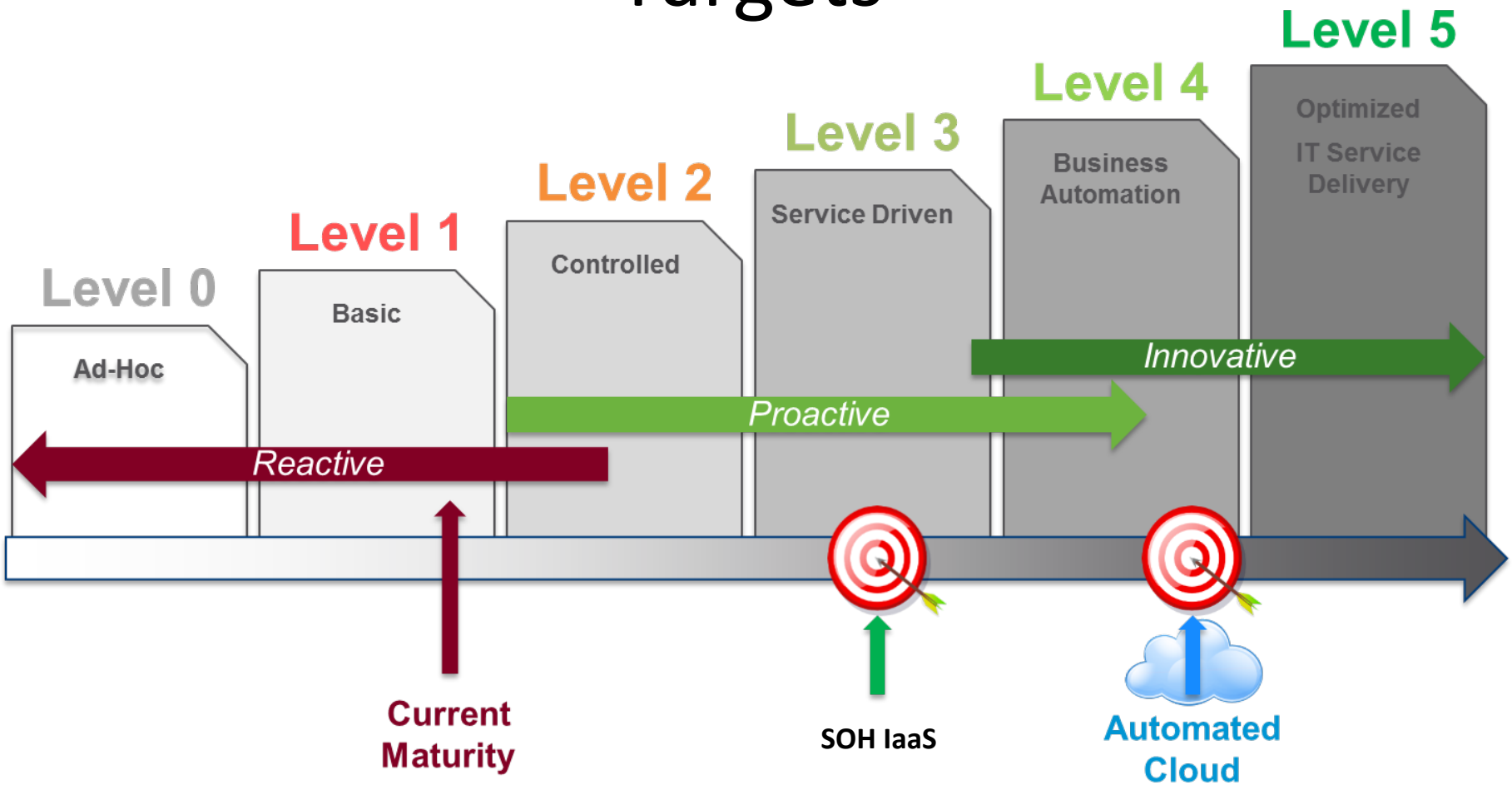
Sample: ITaaS Operations Leadership Team



Operational Readiness Capability Overview



State of Hawaii – Private Cloud Maturity Targets



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Key Recommendations

Strategy	Organization	IT Business and Consumer Control	Service Control	Operations Control	Infrastructure Control
Red ◆ Green	Red ◆ Green	Red ◆ Green	Red ◆ Green	Red ◆ Green	Red ◆ Green

Establish IPC Infrastructure & VMware software

- IaaS 24 hr. SLA
- Disaster Recovery in 72 hrs.
- Convert to "Cloud First" policy

Implement Cloud Operations Leadership Team

- COLT structure & function training
- Execution Excellence Training
- Converge ICSD & OIMT teams

Implement Best-practice ITSM Structure

- SaaS or On-premise
- Best-practice ITIL core processes
- Predictive Dashboard for Growth

Manage IT Financials

- IT Show-back in 2014
- Chargeback on Customer services
- Budgeting based on show-back data

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Cloud Service Management Lifecycle

Strategy Development

- Review or Develop Strategy
- Business Goal Alignment
- Current State Analysis
- Future State Description
- Service Blueprint & Roadmap
- Gap Analysis

Operational Readiness Assessment

- Detailed Discovery
- Detail of Focus in 5 Areas
- Baseline Maturity of Key Process
- Detailed Technical Discovery
- Service Technical Architecture
- Gap Analysis

Financial Mgmt. Assessment

- IT Budget Analysis
- CapEx / OpEx Budget Implications
- Profitability / P&L Targets
- Financial Transparency
- Showback / Chargeback Maturity
- Organizational Culture

Service Definition

- End User Requirements
- Service Portfolio Mgmt.
- Capacity Management
- Demand Forecasting
- BAU Service Inventory
- Governance, Security & Risk
- Service Delivery Strategy (Provider vs. Broker)

IT Service Costing

- Service Category Definition
- IT Cost Allocation
- Unit Drivers Determination
- Service Unit Costing

Service Pricing & Promotion

- Customer Segregation
- Steady-State Demand Sizing
- Competitive Analysis
- Value Articulation
- Strategic Pricing Consideration
- Promote & Incentivize
- IT Sales Development
- Consumption Sensitivity

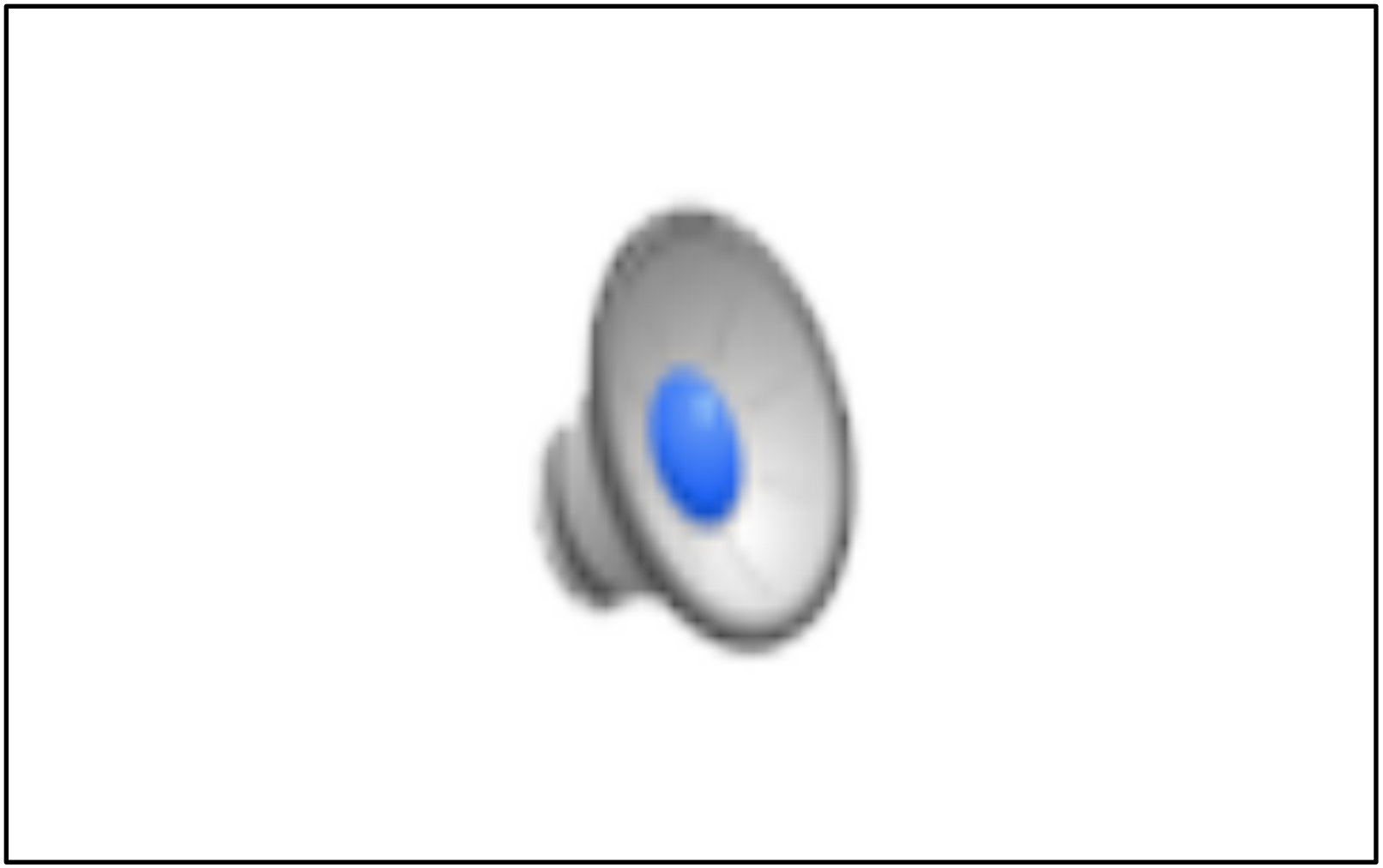
Service Consumption & Metering

- Service Provisioning
- Metering Requirements
- Data Mapping
- Chargeback Detail Definition
- Invoicing
- Vendor Management Maturity
- Fund Transfer / Collection (If Applicable)

Measurement & Reporting

- SLA Management / Fulfillment
- Service Quality
- Actual to Target
- Customer Satisfaction
- Executive Dashboard Definition
- Service Delivery Trends
- Opportunity Analysis
- TCO / ROI

Government Private Cloud – on Demand Provisioning of Servers

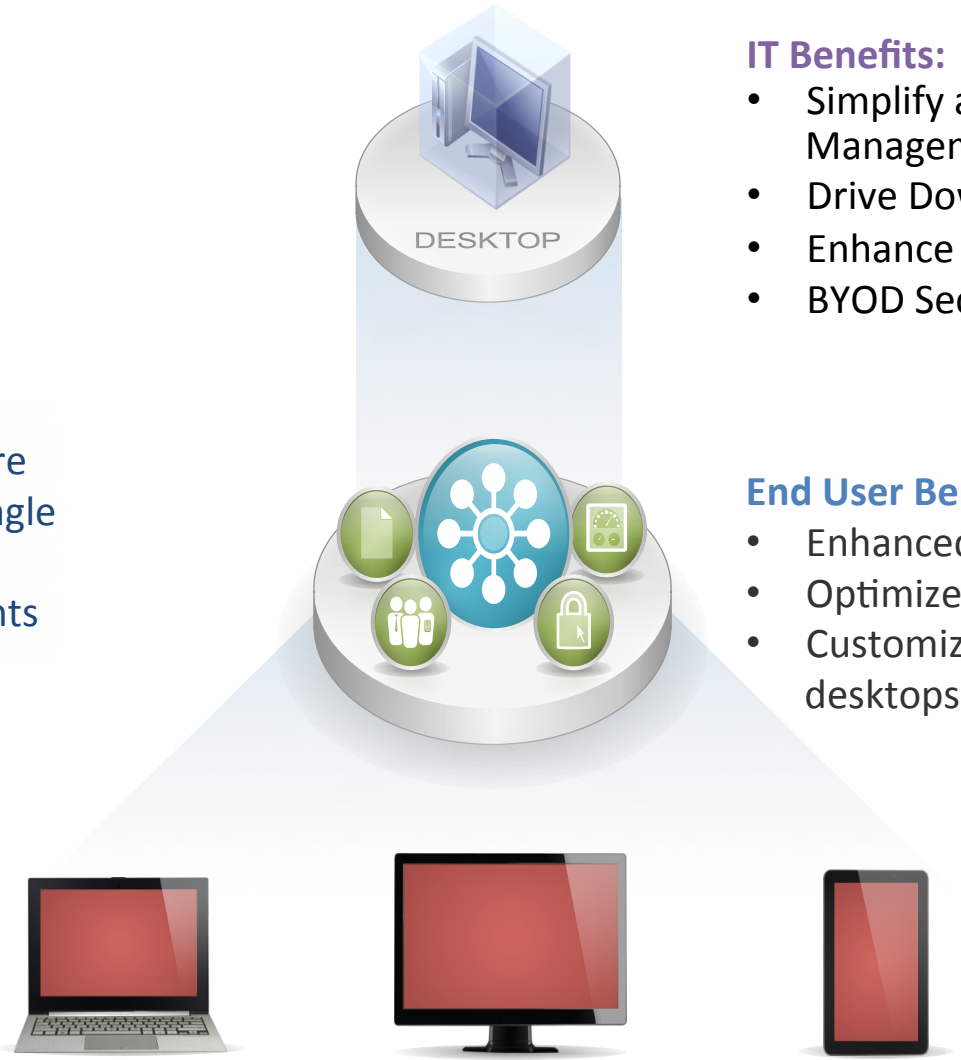


Virtualize desktops into a Centralized Service

Transform: Simplify desktops and apps into the datacenter with virtualization

Broker: Manage and secure virtual desktops from a single admin console while removing data off endpoints

Deliver: Empower your workforce with secure, roaming access to your same desktop across devices



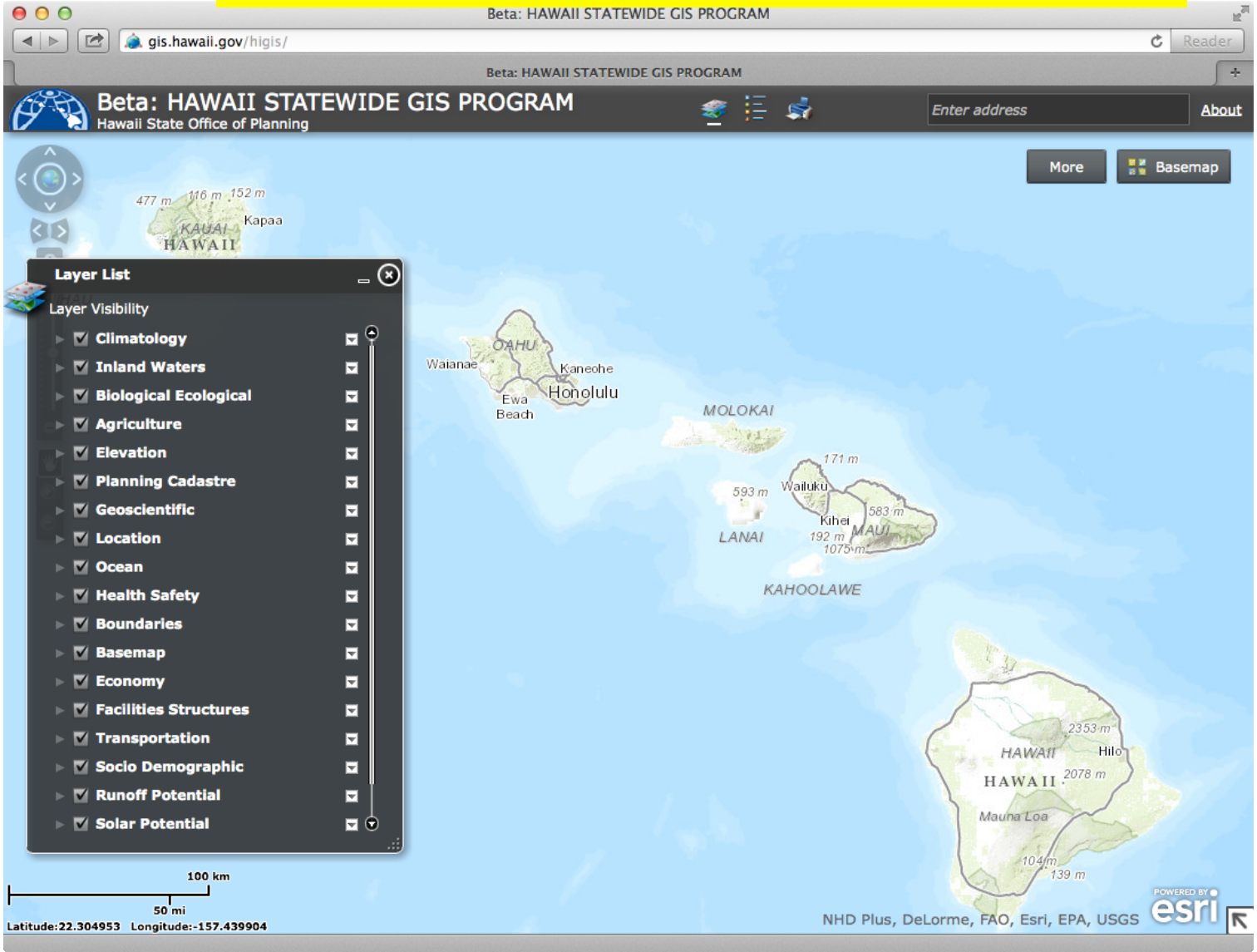
IT Benefits:

- Simplify and Streamline Desktop Management
- Drive Down Costs
- Enhance Security & Compliance
- BYOD Security Compliance

End User Benefits:

- Enhanced User Access & Mobility
- Optimize usability & productivity
- Customize & personalize desktops

Online GeoPlatform: http://gis.hawaii.gov



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ArcGIS Online http://histategis.maps.arcgis.com

Solar Exposure and Rainfall Runoff Applications

A collection of web applications and 3D web scenes showing potential solar roof exposure and rainfall runoff for various buildings in Honolulu, Hawaii.

Search maps

175

63

74

58

18

1,121

0

About the Data

2D and 3D GIS building models and applications showing potential solar and rainfall renewable energy for buildings in Honolulu, Hawaii. Rainfall volume is the number of gallons of runoff expected from 1" of rain on the calculated roof surface area of the building. Solar values were based upon calculated roof area and orientation of roof relative to North, in degrees: 0: North Orientation: 0-80 degrees, 281-360 degrees 1: East Orientation: 81-160 degrees; West Orientation: 201-280 degrees 2: South Orientation: 161-200 degrees Data developed for Hawaii Office of Information Management and Technology (OIMT) by CyberCity 3D, March, 2013. For more information, contact Hawaii Statewide GIS Program,

- **Panel Questions**
  - What are the trends around Consolidated Infrastructure and deploying Shared Services Models?
  - Key Lesson(s) Learned and Best Practice(s)
  - Next Steps
  - How can you help?
  - Who do you contact?
    - Sharon Wong