

Agenda

Session 8 - Legacy Network Reliability Risks

- Fight Obsolescence *Mike Dazio*
 - ZT Technology Solutions
- Repair Solutions for a Legacy Network *Michael Plumb*
 - Precision Electronic Repair Service
- Challenges Facing Transport *Carmine Chase*
 - CenturyLink
- Reflections on Network Reliability Issues *Spilios Makris*
 - Palindrome Technologies



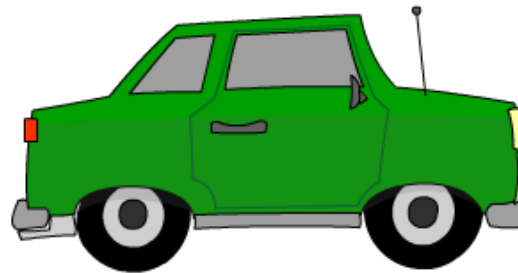
Fight Obsolescence

ZT Technology Solutions' mission is to extend the life of your legacy telecom investment by fighting obsolescence



Networks, Cars, and People

- Network Equipment, Cars, and People have a Life Cycle
- Good news.... That life cycle can be extended



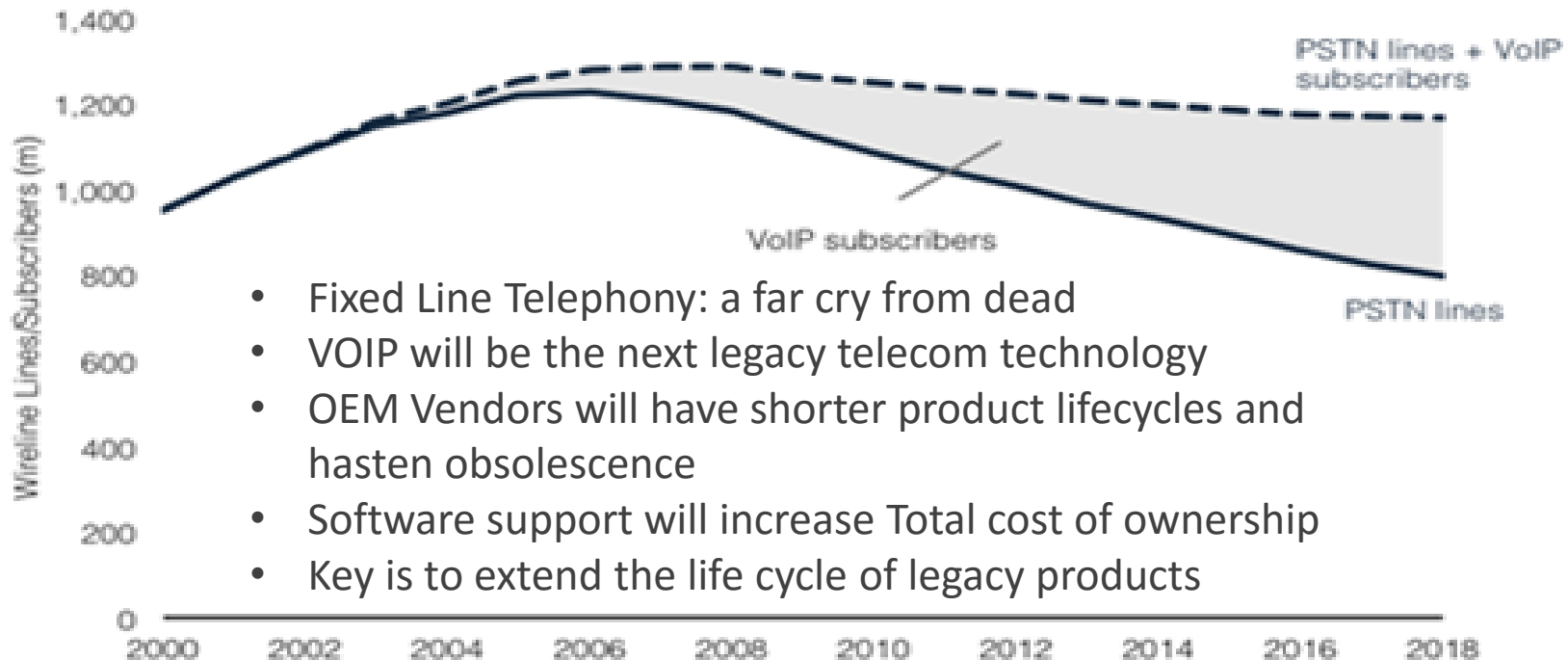
Market Trends



- Aging telecom network
- Subscribers decreasing 10% per year
- Wireline maintenance costs increasing
- Vendors exiting legacy business
- Lack of technical support and repair capability threaten major service disruption
- Cost to Migrate to next generation is too expensive

Global Wirelines PSTN vs. VoIP

Global Wirelines, PSTN vs. VoIP, 2000-2018



- Fixed Line Telephony: a far cry from dead
- VOIP will be the next legacy telecom technology
- OEM Vendors will have shorter product lifecycles and hasten obsolescence
- Software support will increase Total cost of ownership
- Key is to extend the life cycle of legacy products

Extend the life of legacy telecom equipment

Air Force brings 1950s-vintage B-52 bomber into the network-centric 21st century

August 31, 2015

By John Keller

Editor

WRIGHT-PATTERSON AFB, Ohio, 31 Aug. 2015. U.S. Air Force avionics experts are preparing to upgrade 28 Boeing B-52 eight-engine strategic jet bombers to enable the venerable aircraft to log-in to the network-centric battlefield.

Officials of the Air Force Lifecycle Management Center at Wright-Patterson Air Force Base, Ohio, announced a \$46.7 million contract Friday to the Boeing Co. Defense, Space & Security segment in Oklahoma City, Okla., for seven full-rate-production Combat Network Communication Technology (CONNECT) upgrade kits for the B-52 bomber.



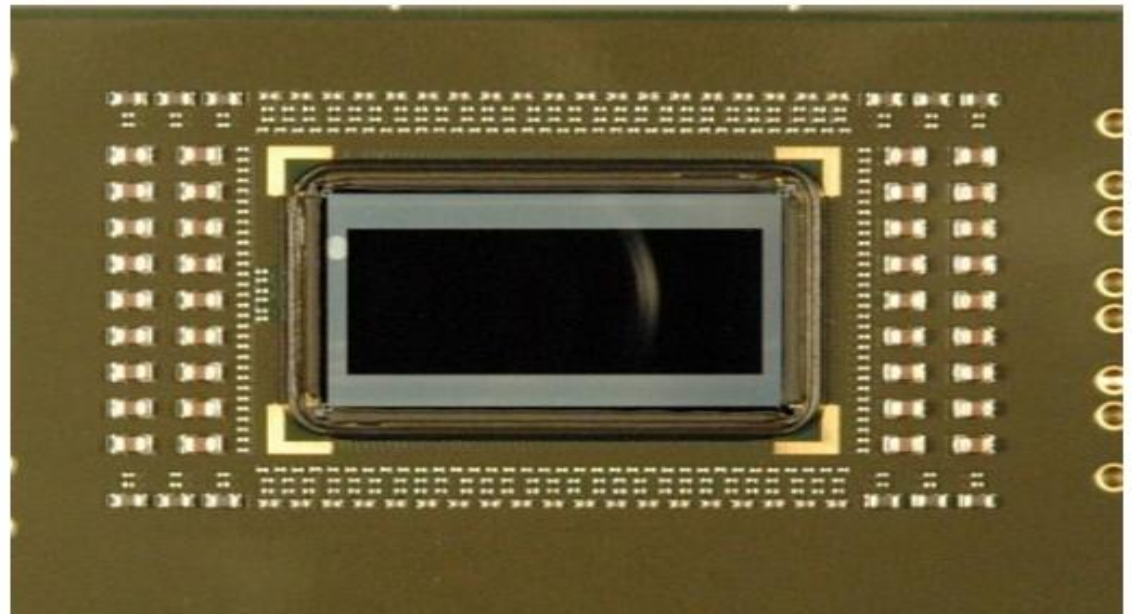
Fight Electronics Obsolescence

Eight contractors chosen for \$7.2 billion DMEA ATSP4 program to fight electronics obsolescence

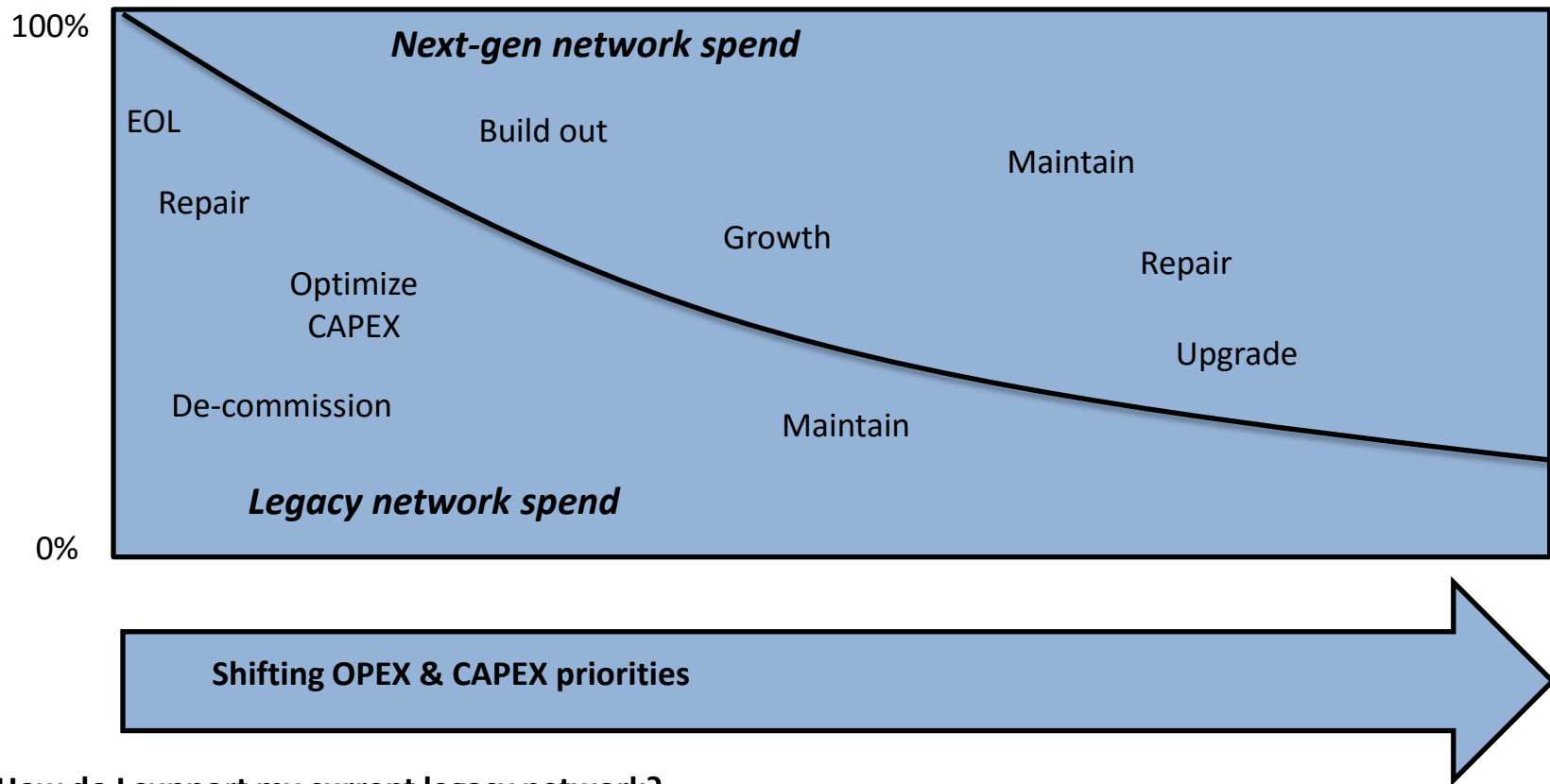
April 1, 2016
By John Keller
Editor

MC CLELLAN, Calif., 1 April 2016. U.S. military microelectronics experts are choosing eight major U.S. defense contractors for a potential \$7.2 billion 12-year program to fight the effects of electronics obsolescence and solve problems of unreliable, unmaintainable, under-performing, or incapable electronics hardware and software.

Officials of the Defense Microelectronics Activity (DMEA) in McClellan, Calif., announced contracts to the eight companies Thursday for the Advanced Technology Support Program IV (ATSP4).



Customer Challenges



How do I support my current legacy network?

- Workforce retiring
- OEMs (Original Equipment Manufacturers) reducing expertise and declaring MD or EOL

How do I reduce my legacy maintenance costs?

- Costs increase 10% – 30% per year
- Alternative to OEM

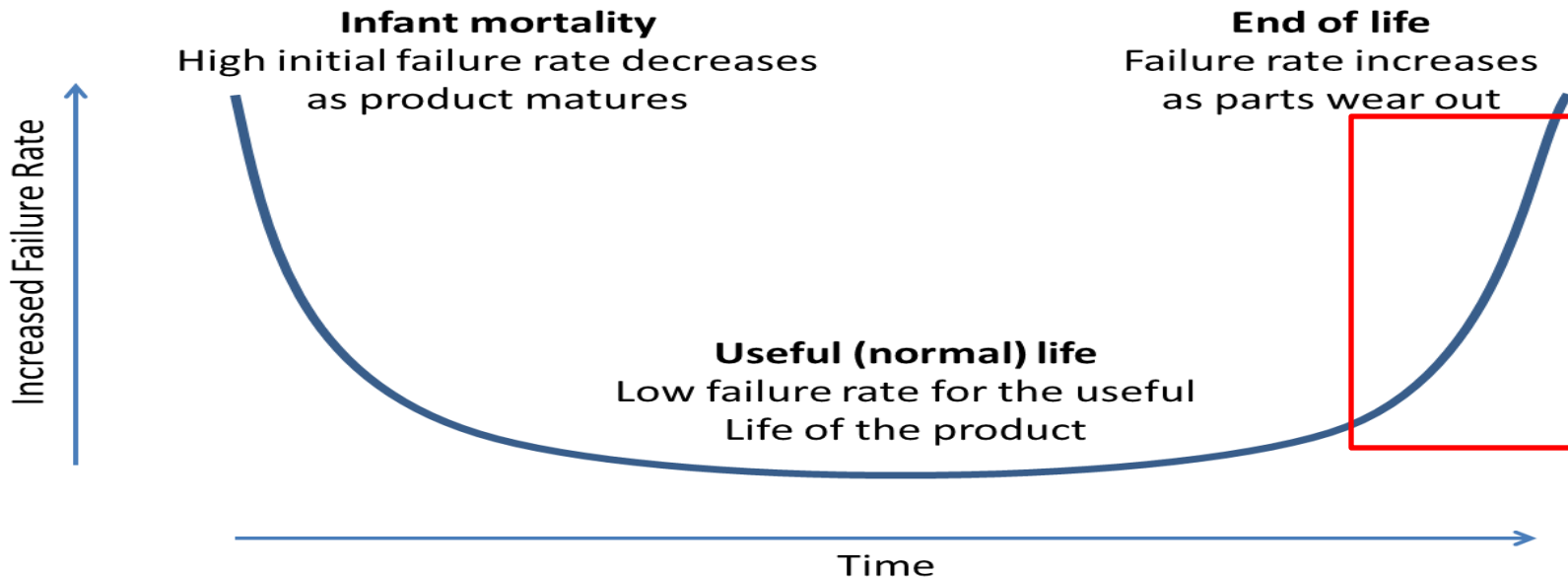
What's the mileage reading on Telecom Network Switches?



Integral parts of the average Telecom network are almost 30 years old!

End of Product Life Cycle

Failure Model (Bathtub Curve)

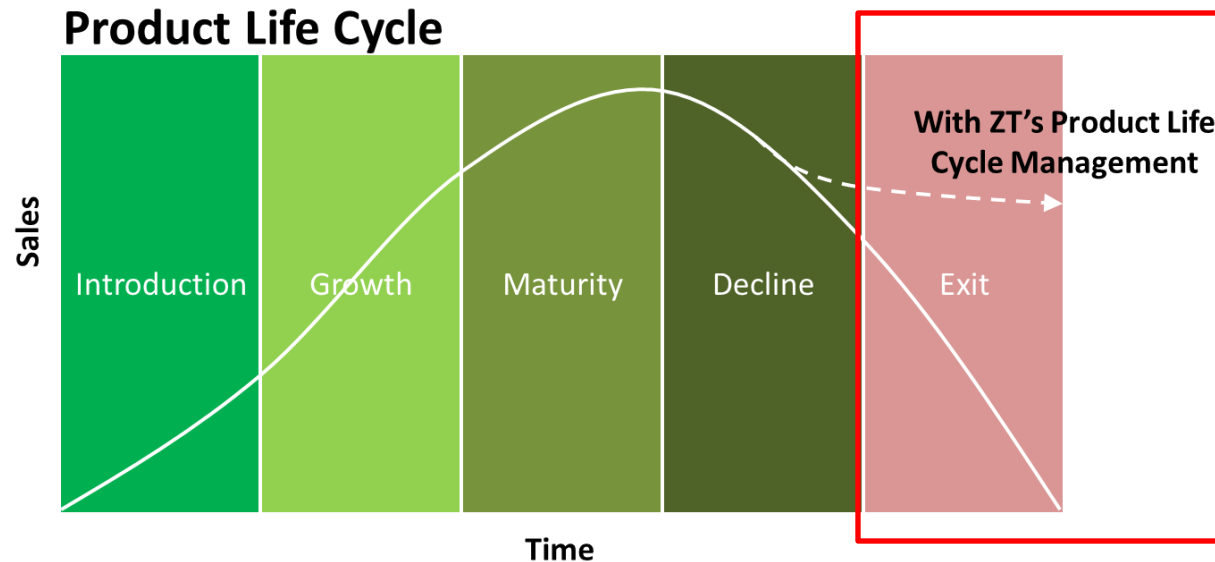


- Telecom Components are MD-ed (Manufacture Discontinued) or EoL (End-of-Life)
- Repair and Replace strategies are necessary to avoid lack of spare parts and catastrophic network failures

Solutions to Extend the life of Legacy Systems

- Assess the network for legacy products
- Manage OEM vendors (Determine End of Life dates)
- Assess the network for legacy products
- Assess Technical Support Issues
- Assess Repair Issues

Extend the life of your legacy telecom equipment



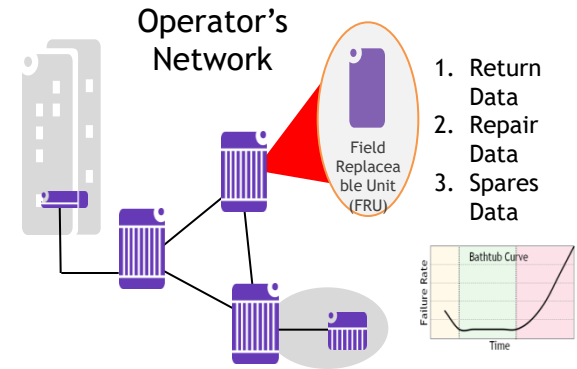
- By providing experienced technical resources
- By developing repair/replace/spare parts strategies
- By developing consolidation and migration strategies

Case Study: Life Cycle Management Tier 1 European Fixed / Mobile Operator

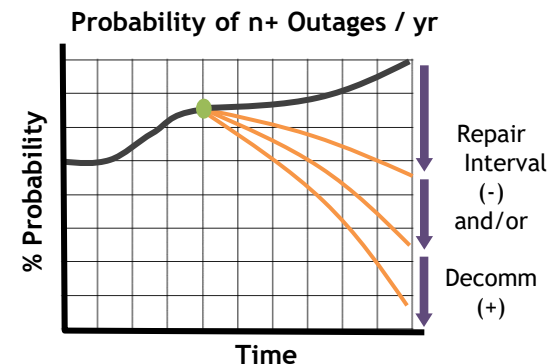
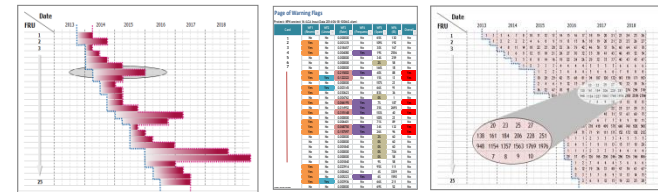
Results

Developed custom program for automated, validated customer data input to Proprietary Bell Labs Life Cycle Analytics tools

- **Sustainability Heat Maps** showed that harvesting program benefits will run out in 2018 (repair avoidance must cease)
- **Warning Flags** identified next problematic product and mitigation required
- **Spares Gap Analysis** developed plan for the recommended 18 mo. inventory on hand
- **Outage Prediction** showed that, for the DXC, decommissioning must accelerate and repair interval must be significantly reduced to avoid increasing probability of outages in the near term.

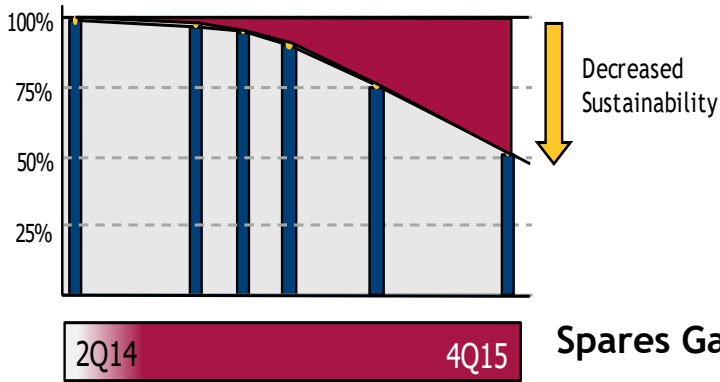


Sustainability Heat Map Warning Flags Spares Gap Calc

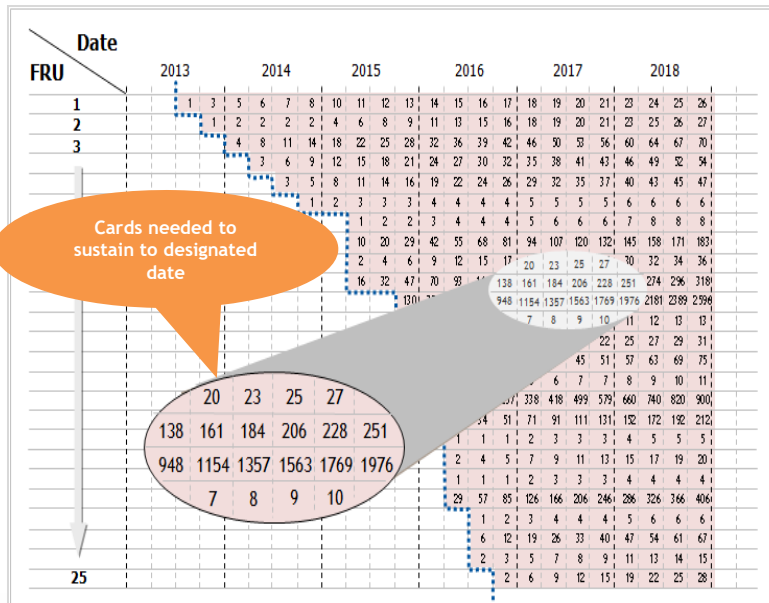


WHAT DOES A LIFE CYCLE MANAGEMENT (LCM) ANALYSIS LOOK LIKE?

Per Card Sustainability Analysis



Spares Gap Analysis - All Cards in a Network



Warning Flags - All Cards in a Network

Page of Warning Flags

Project: (LCA Input Data 2014-06-18-1004v2.xlsm)

Card	WF1 (Recent)	WF2 (Linear)	WF3 (Rate)	WF4 (Frequency)	WF5 (Spares)	WF6 (IB)	Overall
3AL 07011 BC	No	No	0.000000	No	65%	130	No
3AL 07011 EC	Yes	No	0.001235	No	109%	192	No
3AL 07013 BB	Yes	No	0.018457	No	30%	167	No
3AL 07013 EB	Yes	No	0.004080	Yes	19%	2556	No
3AL 07017 BA	No	No	0.000000	No	34%	259	No
3AL 07017 EA	No	No	0.000000	No	2%	58	No
3AL 07022 BC	No	No	0.000000	No	144%	18	No
3AL 07022 BD	Yes	No	0.215002	Yes	40%	88	Yes
3AL 07022 BZ	Yes	Yes	0.122222	No	15%	13	Yes
3AL 07023 BA	No	No	0.000000	No	157%	23	No
3AL 07023 EA	Yes	Yes	0.003145	No	66%	91	No
3AL 07024 BA	Yes	No	0.030623	No	83%	36	No
3AL 07225 BD	No	No	0.004762	No	0%	1	No
3AL 07385 BA	Yes	No	0.066195	Yes	7%	187	Yes
3AL 07385 EB	No	No	0.014952	Yes	35%	2695	No
3AL 07386 HB	Yes	No	0.315148	Yes	153%	40	Yes
3AL 07453 BA	No	No	0.000000	No	100%	23	No
3AL 07453 EA	Yes	No	0.006401	No	71%	89	No
3AL 07584 BB	Yes	No	0.068750	Yes	34%	132	Yes
3AL 07584 BC	Yes	No	0.157597	Yes	26%	96	Yes
3AL 07731 BA	No	No	0.000000	No	2%	60	No
3AL 07731 BC	No	No	0.000000	No	0%	60	No
3AL 07731 BD	No	No	0.001840	No	0%	60	No
3AL 07732 BA	No	No	0.000000	No	0%	704	No
3AL 07732 BC	No	No	0.000000	No	0%	58	No
3AL 07732 BD	No	No	0.001840	No	9%	58	No
3AL 07784 BC	Yes	No	0.023914	No	95%	111	No
3AL 07784 EC	Yes	No	0.000462	No	4%	3359	No
3AL 07784 ED	Yes	No	0.005223	Yes	6%	1590	No
3AL 07877 BA	Yes	Yes	0.003936	No	66%	211	No
3AL 07878 BB	No	No	0.000000	No	69%	52	No

Next Steps

- Assess the legacy network and vendors
- Develop Life Cycle Management plan for all legacy products
- Implement plan and business case for critical products

For more Information contact:

Mike Dazio

mdazio@zttechsol.com

732-217-3081

Giovanni Cintorrino

gcintorrino@zttechsol.com

908-342-1968



Back up



Solutions to Extend the life of Legacy Systems

- ❑ Assess the network for legacy products
- ❑ Manage OEM vendors (Determine End of Life dates)
- ❑ Assess the network for legacy products
- ❑ Assess Technical Support Issues
 - Most problems are simple in nature and are man-made:
 - No back-ups of most recent software, documentation or database
 - Can't locate password of back up servers
 - Basic troubleshooting skills and preventative maintenance techniques need to be addressed
 - Be proactive - monitor the network, look for patterns of failure (e.g. excessive repairs of certain codes)
 - Inexperienced technicians can be trained
 - Technical Support Competence must be maintained
 - Highly skilled technical people do exist
 - Tier 1/2/3 can be outsourced

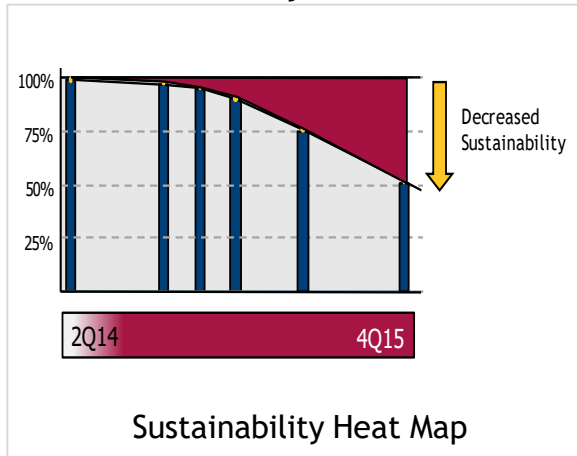
Solutions to Extend the life of Legacy Systems (cont.)

□ Assess Repair Issues

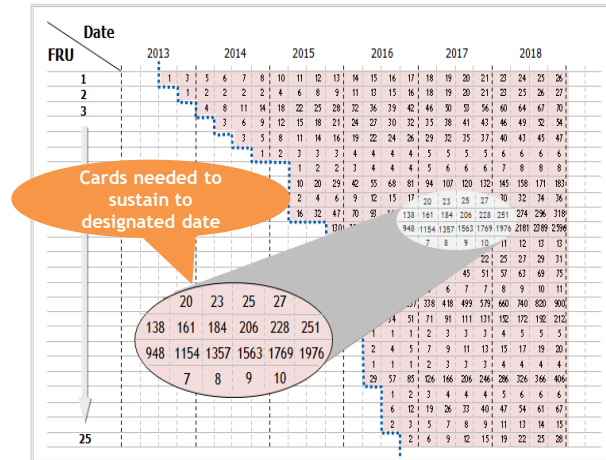
- Manage spares inventory
- Most repairs are due to heat and electromechanical failures and lack of preventive maintenance (disk drives, power supplies, fans, filters, cables)
- Repair Capability must be maintained
 - Repair companies that specialize in legacy products do exist (Precision ERS)
 - Parts do exist
 - Migration, consolidation of platforms, harvesting of spares
 - Replacement parts can be reverse engineered

WHAT DOES A LIFE CYCLE MANAGEMENT (LCM) ANALYSIS LOOK LIKE?

Per Card Sustainability Analysis



Spares Gap Analysis - All Cards in a Network



Warning Flags - All Cards in a Network

Page of Warning Flags							
ILCA Input Data 2014-05-18-10042.stm							
Card	WF1 (Recent)	WF2 (Lines)	WF3 (Rate)	WF4 (Spares)	WF5 (Spares)	WF6 (dB)	Overall
3AL07011 BC	No	No	0.00000	No	651	130	No
3AL07011 EC	Yes	No	0.00125	No	1096	192	No
3AL07013 BB	Yes	No	0.01647	No	308	167	No
3AL07013 EB	Yes	No	0.00480	Yes	191	2556	No
3AL07017 BA	No	No	0.00000	No	341	259	No
3AL07017 EA	No	No	0.00000	No	28	58	No
3AL07022 CC	No	No	0.00000	No	1461	18	No
3AL07022 BD	Yes	No	0.21902	Yes	405	88	Yes
3AL07022 BZ	Yes	Yes	0.12222	No	151	13	Yes
3AL07023 BA	No	No	0.00000	No	1571	23	No
3AL07023 EA	Yes	Yes	0.003145	No	661	91	Yes
3AL07024 BA	Yes	No	0.03623	No	835	36	No
3AL07225 BD	No	No	0.004742	No	0	1	No
3AL07385 BA	Yes	No	0.066195	Yes	71	187	Yes
3AL07385 EB	No	No	0.014952	Yes	351	2695	No
3AL07386 HB	Yes	No	0.031546	Yes	1533	40	Yes
3AL07453 BA	No	No	0.00000	No	1000	23	No
3AL07453 EA	Yes	No	0.004401	No	711	89	No
3AL07584 BB	Yes	No	0.068750	Yes	341	132	Yes
3AL07584 BC	Yes	No	0.032587	Yes	261	96	Yes
3AL07731 BA	No	No	0.00000	No	21	60	No
3AL07731 BC	No	No	0.00000	No	0	60	No
3AL07731 BD	No	No	0.001840	No	0	60	No
3AL07732 BA	No	No	0.00000	No	0	704	No
3AL07732 BC	No	No	0.00000	No	0	58	No
3AL07732 BD	No	No	0.001840	No	9	58	No
3AL07784 BC	Yes	No	0.023914	No	991	111	No
3AL07784 EC	Yes	No	0.004642	No	45	3359	No
3AL07784 ED	Yes	No	0.005221	Yes	65	1590	No
3AL07877 BA	Yes	Yes	0.003936	No	661	211	No
3AL07878 BB	No	No	0.00000	No	691	52	No

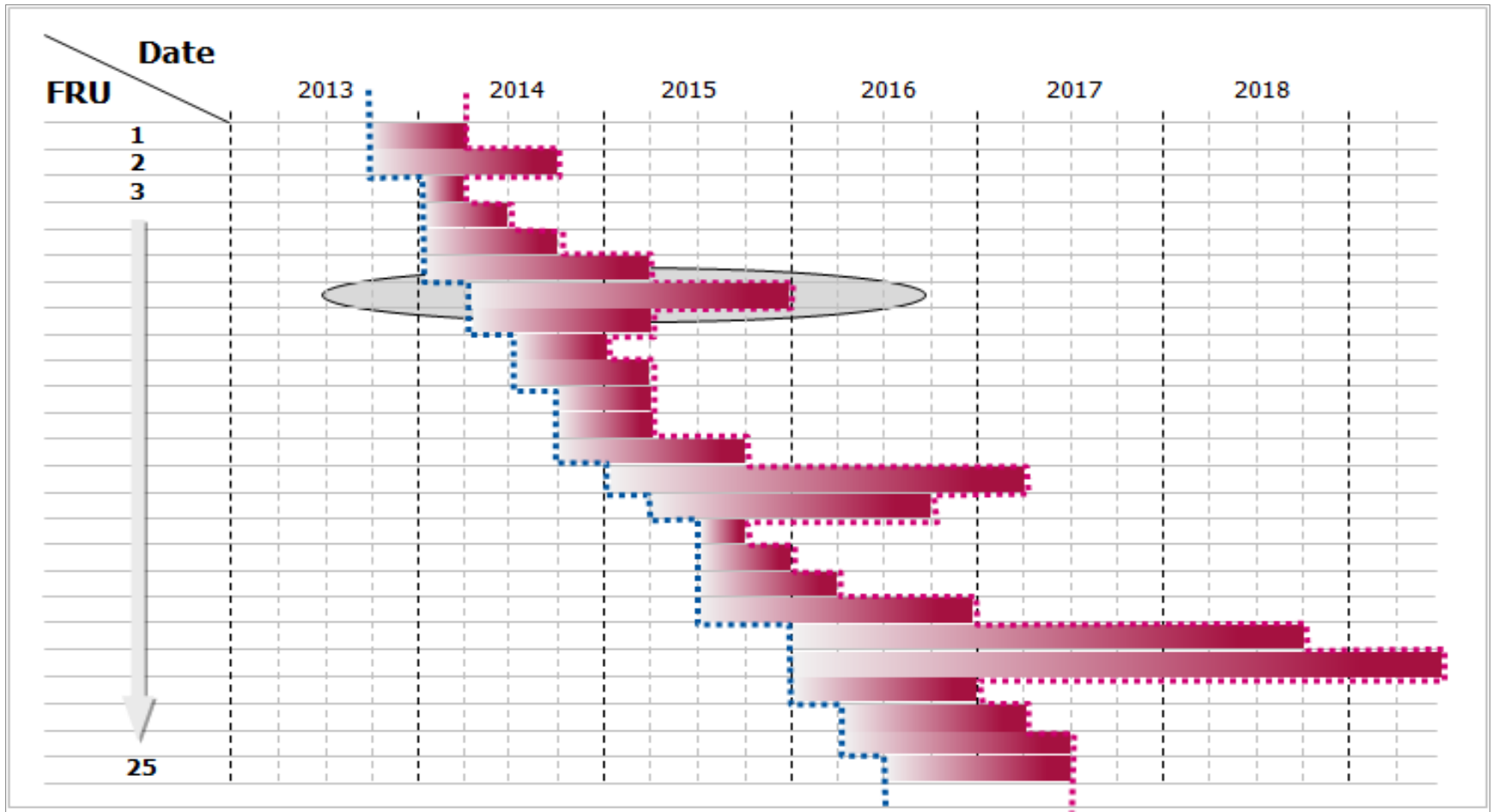
- Identifies, based on projected failure rates, when key components will reach an End-of-Stock condition
- Uses a stand-alone, smart data acquisition template which contains historical network data including return counts and installed base
- Prediction module provides failure rate trending information required for network outage prediction modeling.

- Applies statistical analyses to capture trending and predict failure rates
- Calculates additional spares required to mitigate any out-of-stock threat
- Additional parameters such as repair contract duration, vendor performance, and on-hand inventory are analyzed
- Capacity to address up to 1000 cards (at a time) and accommodate up to 20 mitigation scenarios.

- Consistent and proven technique to identify risk across all cards and enable clear, effective and transparent communication
- Algorithms and thresholds proactively identify high risk cards in advance
- Identifies and quantifies risk indicators in multiple dimensions.



Sustainability Heat Map



Spares Gap Calc

FRU	Date																												
	2013					2014					2015					2016					2017					2018			
1	1	3	5	6	7	8	10	11	12	13	14	15	16	17	18	19	20	21	23	24	25	26							
2		1	2	2	2	2	4	6	8	9	11	13	15	16	18	19	20	21	23	25	26	27							
3			4	8	11	14	18	22	25	28	32	36	39	42	46	50	53	56	60	64	67	70							
4				3	6	9	12	15	18	21	24	27	30	32	35	38	41	43	46	49	52	54							
5					3	5	8	11	14	16	19	22	24	26	29	32	35	37	40	43	45	47							
6						1	2	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6							
7							1	2	2	3	4	4	4	4	5	6	6	6	7	8	8	8							
8								10	20	29	42	55	68	81	94	107	120	132	145	158	171	183							
9								2	4	6	9	12	15	17	20	23	25	27	30	32	34	36							
10								16	32	47	70	93	116	139	162	184	206	228	251	274	296	318							
11											130	259	388	517	646	775	904	1033	1162	1291	1420	1549							
12															138	161	184	206	228	251	274	296							
13																7	8	9	10	11	12	13							
14																													
15																													
16																													
17																													
18																													
19																													
20																													
21																													
22																													
23																													
24																													
25																													

Warning Flags

Page of Warning Flags

(LCA Input Data 2014-06-18-1004v2.xlsm)

Card	WF1 (Recent)	WF2 (Linear)	WF3 (Rate)	WF4 (Frequency)	WF5 (Spare)	WF6 (IB)	Overall
3AL 07011 BC	No	No	0.000000	No	65%	130	No
3AL 07011 EC	Yes	No	0.001235	No	109%	192	No
3AL 07013 BB	Yes	No	0.018457	No	30%	167	No
3AL 07013 EB	Yes	No	0.004080	Yes	19%	2556	No
3AL 07017 BA	No	No	0.000000	No	34%	259	No
3AL 07017 EA	No	No	0.000000	No	2%	58	No
3AL 07022 BC	No	No	0.000000	No	144%	18	No
3AL 07022 BD	Yes	No	0.215002	Yes	40%	88	Yes
3AL 07022 BZ	Yes	Yes	0.122222	No	15%	13	Yes
3AL 07023 BA	No	No	0.000000	No	157%	23	No
3AL 07023 EA	Yes	Yes	0.003145	No	66%	91	No
3AL 07024 BA	Yes	No	0.030623	No	83%	36	No
3AL 07225 BD	No	No	0.004762	No	0%	1	No
3AL 07385 BA	Yes	No	0.066195	Yes	7%	187	Yes
3AL 07385 EB	No	No	0.014952	Yes	35%	2695	No
3AL 07386 HB	Yes	No	0.315148	Yes	153%	40	Yes
3AL 07453 BA	No	No	0.000000	No	100%	23	No
3AL 07453 EA	Yes	No	0.006401	No	71%	89	No
3AL 07584 BB	Yes	No	0.068750	Yes	34%	132	Yes
3AL 07584 BC	Yes	No	0.157597	Yes	26%	96	Yes
3AL 07731 BA	No	No	0.000000	No	2%	60	No
3AL 07731 BC	No	No	0.000000	No	0%	60	No
3AL 07731 BD	No	No	0.001840	No	0%	60	No
3AL 07732 BA	No	No	0.000000	No	0%	704	No
3AL 07732 BC	No	No	0.000000	No	0%	58	No
3AL 07732 BD	No	No	0.001840	No	9%	58	No
3AL 07784 BC	Yes	No	0.023914	No	95%	111	No
3AL 07784 EC	Yes	No	0.000462	No	4%	3359	No
3AL 07784 ED	Yes	No	0.005223	Yes	6%	1590	No
3AL 07877 BA	Yes	Yes	0.003936	No	66%	211	No
3AL 07878 BB	No	No	0.000000	No	69%	52	No