Service Provider Challenges Require Bell Labs Experts



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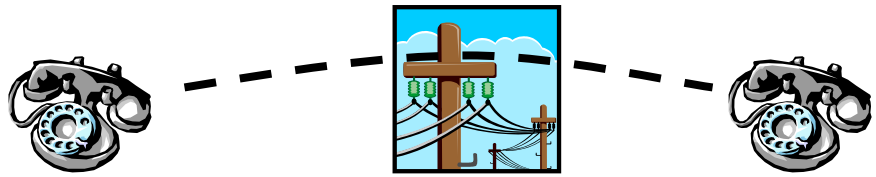
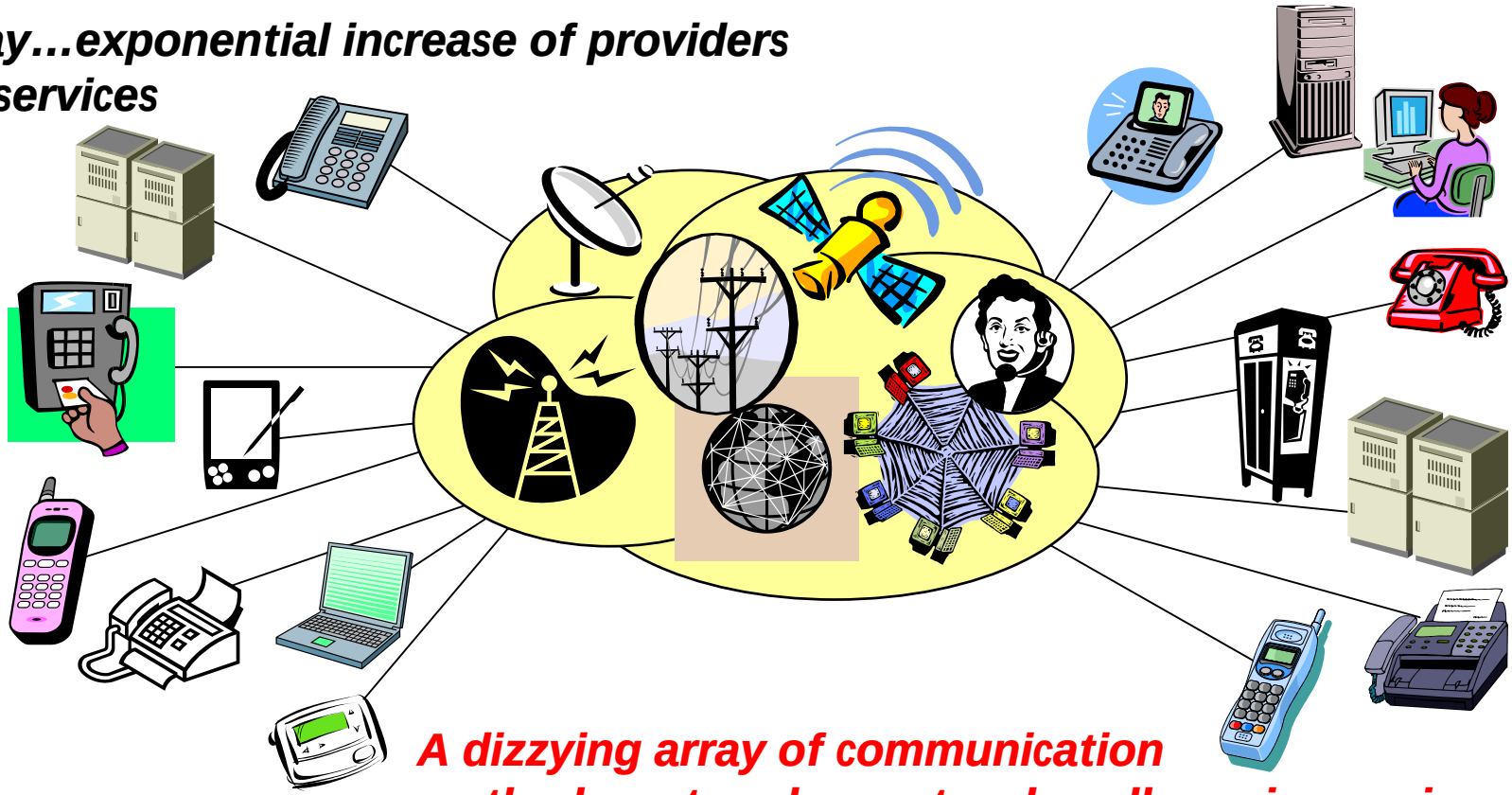
Lucent Technologies
Bell Labs Innovations

History – Telecom then and now…

In the beginning …one service provider…one service…



Today…exponential increase of providers and services

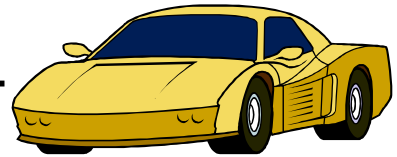


A dizzying array of communication methods, networks, protocols…all require service…

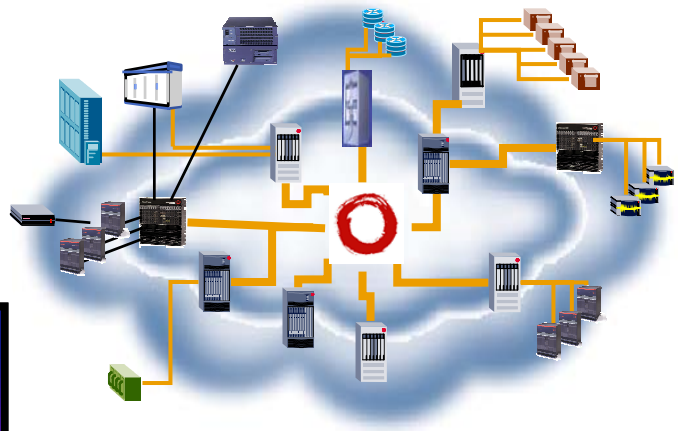
Size and Complexity



Home Network
10 computers



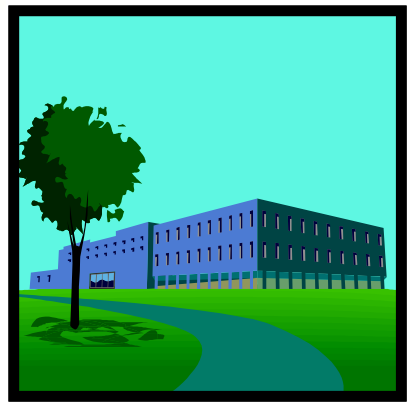
Automobile
100 computers



>200,000,000 interconnected computers in a large service provider network

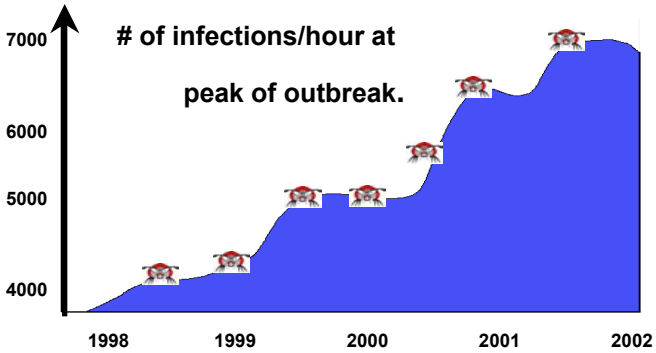


Sm/Med Enterprise
1000 computers



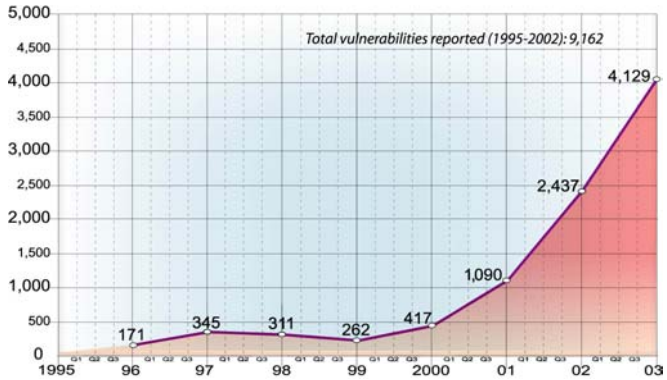
Lg Enterprise
10,000+ computers

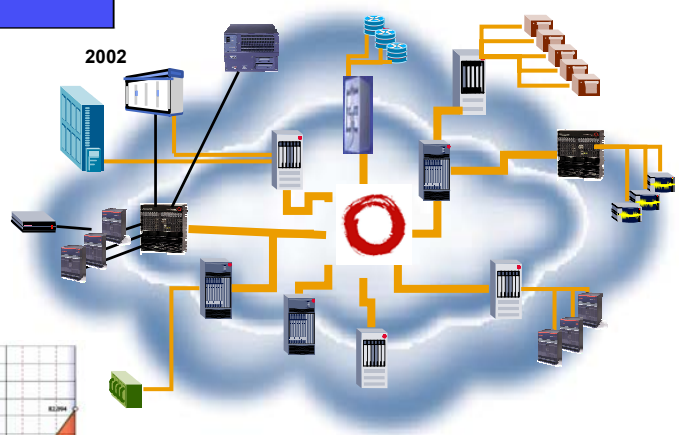
Security and Reliability



Source: Network Associates, 1/03

Growth in Number of Vulnerabilities Reported to CERT/CC

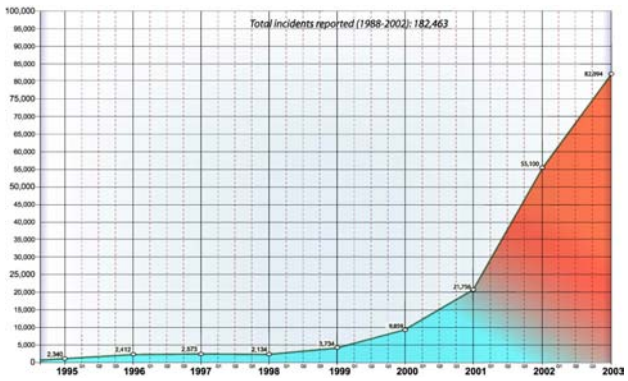




Financial Impact of Attacks

- Klez virus: $9 billion
- Code Red: 1 million computers affected: $2.6 billion
- Love Bug: 50 variants, 40 million computers affected: $8.8 billion

Growth in Number of Incidents Reported to CERT/CC

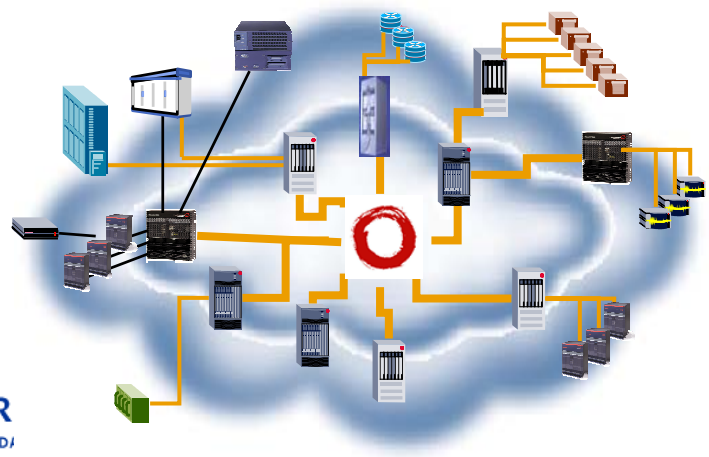


Availability	DPM	Downtime Per Year (24x7x365)		
99.000%	10000	3 Days	15 Hours	36 Minutes
99.500%	5000	1 Day	19 Hours	48 Minutes
99.900%	1000		8 Hours	46 Minutes
99.950%	500		4 Hours	23 Minutes
99.990%	100			53 Minutes
99.999%	10			5 Minutes
99.9999%	1			30 Seconds

"High Availability"

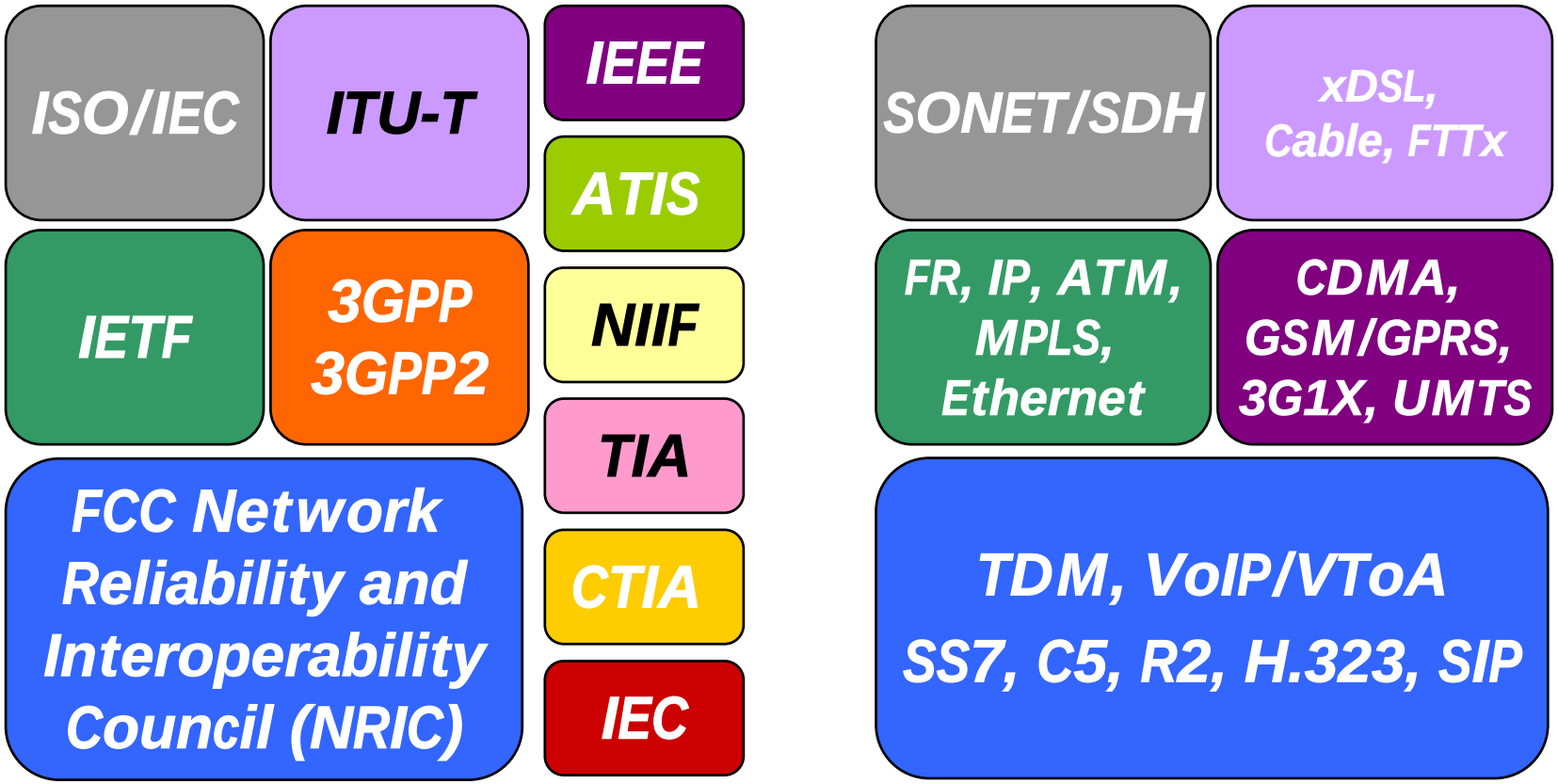
DPM – Defects per Million

Multivendor Maze



Regulated and Standards-based

Experts from Lucent and Bell Labs are active in over 100 organizations and consortia/forums addressing standards for the telecom industry



Service Provider Challenges and Bell Labs Solutions



Customers have lots of tough questions:

How can I recover stranded capacity?

How do I evolve my network from C2P?

How vulnerable is my network?

What are the opportunities/risks of entering a new market?

LWS & Bell Labs jointly assess and strategize



Bell Labs innovations tackle service provider challenges



Bell Labs Researchers and Developers:

Theorize

Create business cases

Develop applications & new technologies

Lead standards efforts

Write new algorithms

Bell Labs and Lucent Worldwide Services Traction

Key Statistics

- ✓ Four-fold increase in services-related research since 2002
- ✓ 20 percent of Bell Labs' researchers are collaborating with LWS
- ✓ 20 percent of Lucent's patents are services related
- ✓ 33 percent of LWS' Services Portfolio is built upon Bell Labs technology
- ✓ More than 25 Bell Labs tools and technologies are under development for LWS

Results

Continue and expand existing engagements:

Wireless RF Optimization Suite

- OCELOT®

Records and Asset Verification Service

- NetInventory™ Auto Discovery tool

Develop new service offerings:

- ATM/SONET/MPLS Bandwidth Recovery
- Celnet Xplorer – 3G Measurement Suite

Explore potential future services:

- PatchInventory and IPv6
- E911 and iLocator

Bell Labs and LWS Customer Seminars

- Worldwide roll-out

Business Challenges Lead to Research Opportunities

Economic realities in the service provider market…

- Sharp decline in Capex in last 3 years
- Almost constant Opex

	Total Spend $B	*Capex %*	*Opex %*
2001	*987*	*29%*	*67%*
2002	*1,035*	*20%*	*65%*
2003	*1,072*	*18%*	*65%*

… drive new research problems to solve…

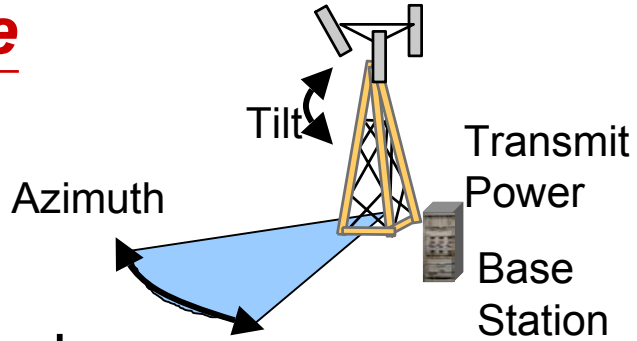
- *Maintenance scheduling ← → Time constrained traveling salesman*
- *Bandwidth recovery ←→ Maximal ring identification*
- *Revenue recovery ←→ Unbilled services and stranded assets*

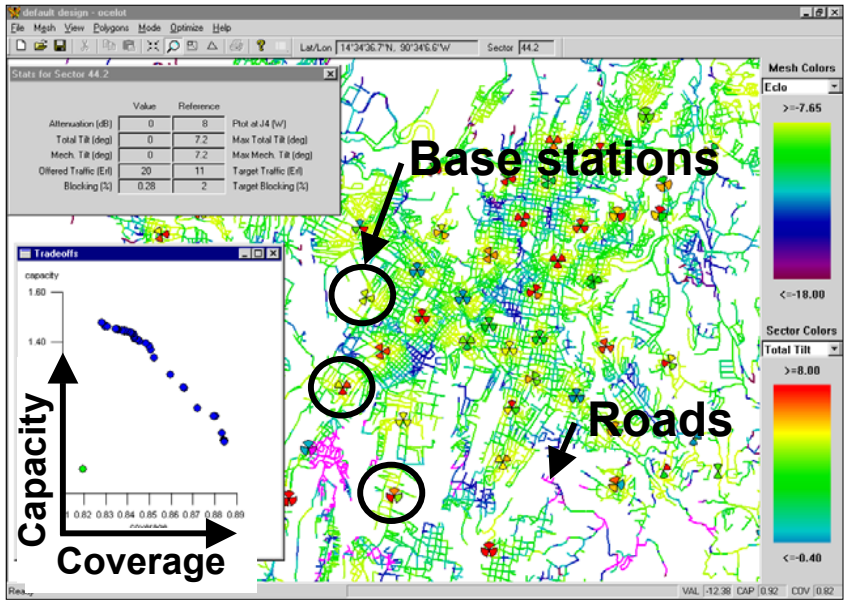
… using algorithms which increase service provider efficiency, reduce their costs and maximize existing investments.

Existing Engagements: Professional Services

Wireless RF Optimization Suite

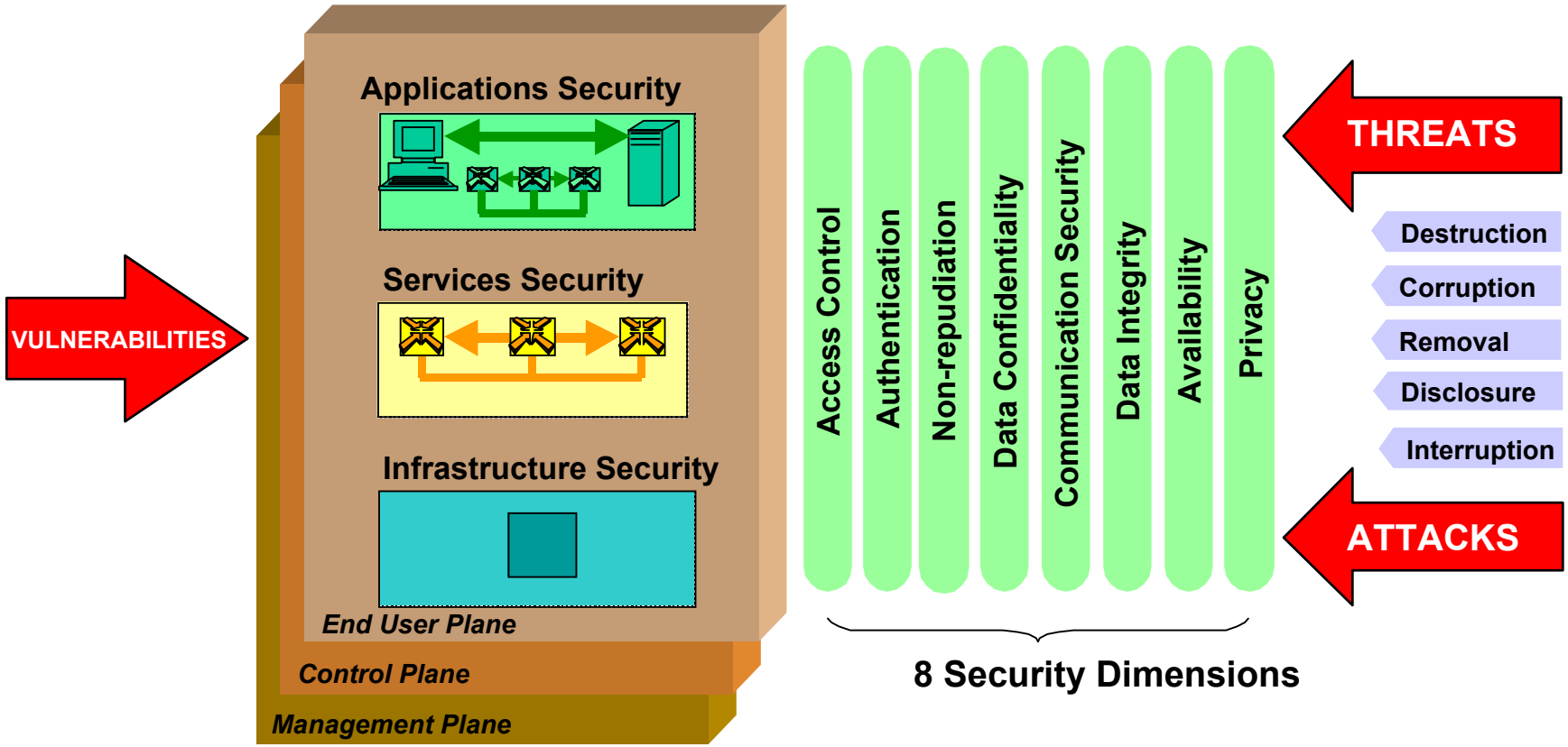
- Based on Bell Labs' OCELOT® technology
- Optimizes design and speeds deployment of new mobile networks
- Superior to Drive Test Optimization
- Successfully used in more than 100 countries:
  China Unicom
- Improves overall performance of existing mobile networks





Existing Engagements: Network Security and Reliability

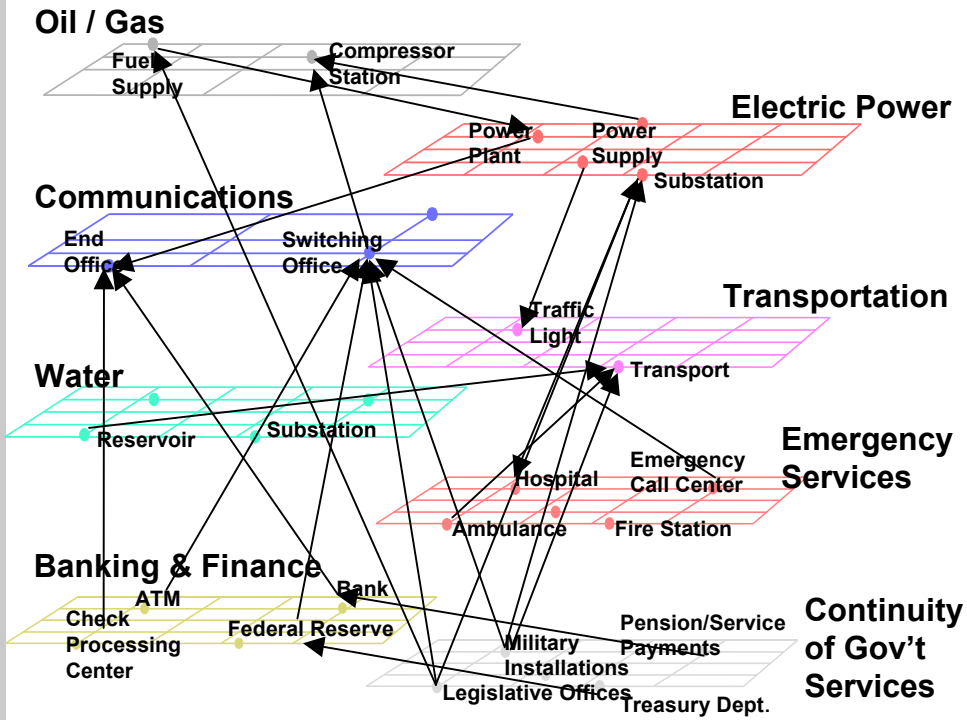
Bell Labs' Network Security Architecture adopted as ITU Standard X.805 (10/03)…



…it's the foundation of LWS' Network Security and Reliability Assessment Service

Network Security Case Study: Sandia Labs (U.S. Dept of Energy)

Bell Labs is working with Sandia to model the interdependencies between telecom and other critical infrastructures to minimize the impact of outages and disasters.



Challenges

- ***Critical infrastructures are Complex and Interdependent***
- ***They are Key to U.S. economic and national Security***
- ***They are Vulnerable to natural and malevolent acts, system complexities, and interdependencies***
- ***There are Institutional Barriers to information sharing***

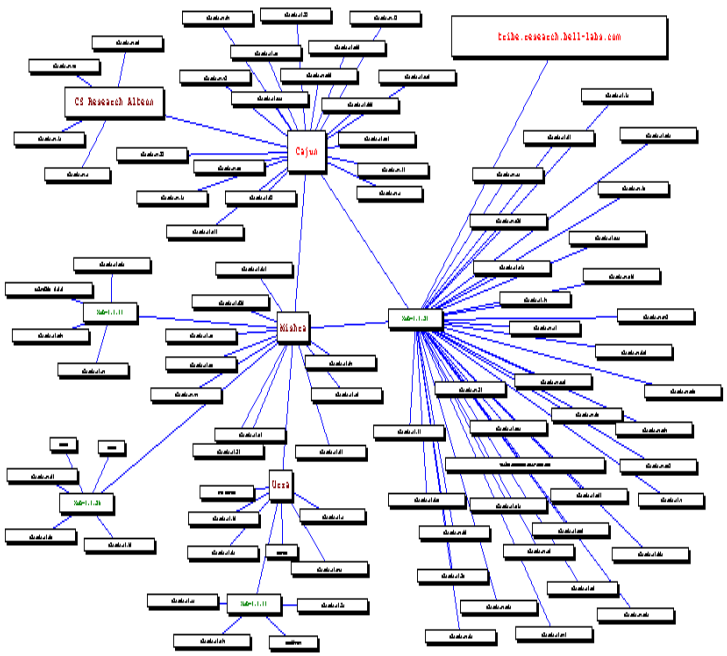
In the Pipeline: PatchInventory™

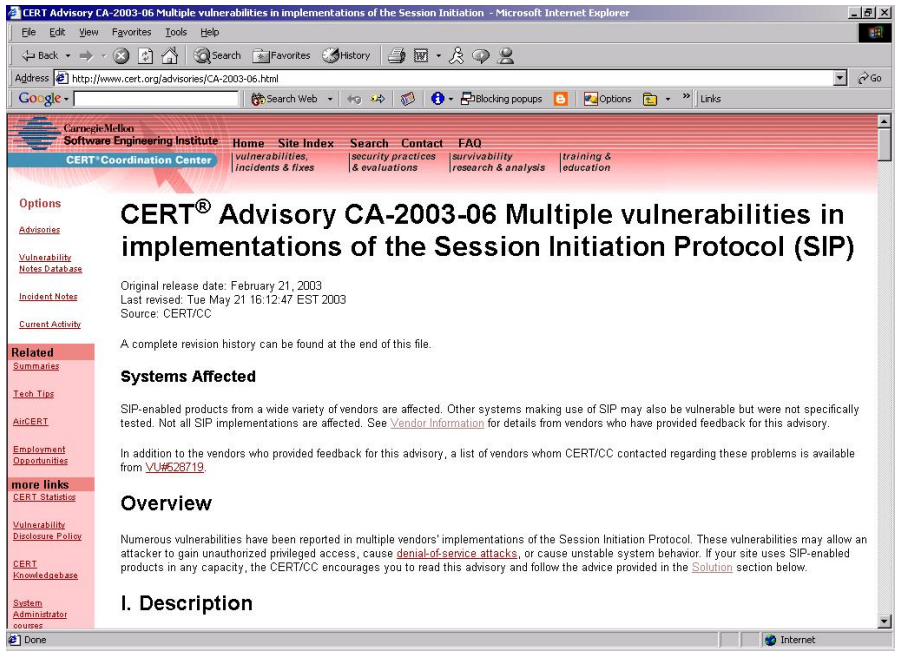
Analytical network security tool combining:

- ***NetInventory™ data***
- ***Vendor security bulletins***

Identifies patch status for all network elements

Manages rollout of patches across multivendor network, in best order





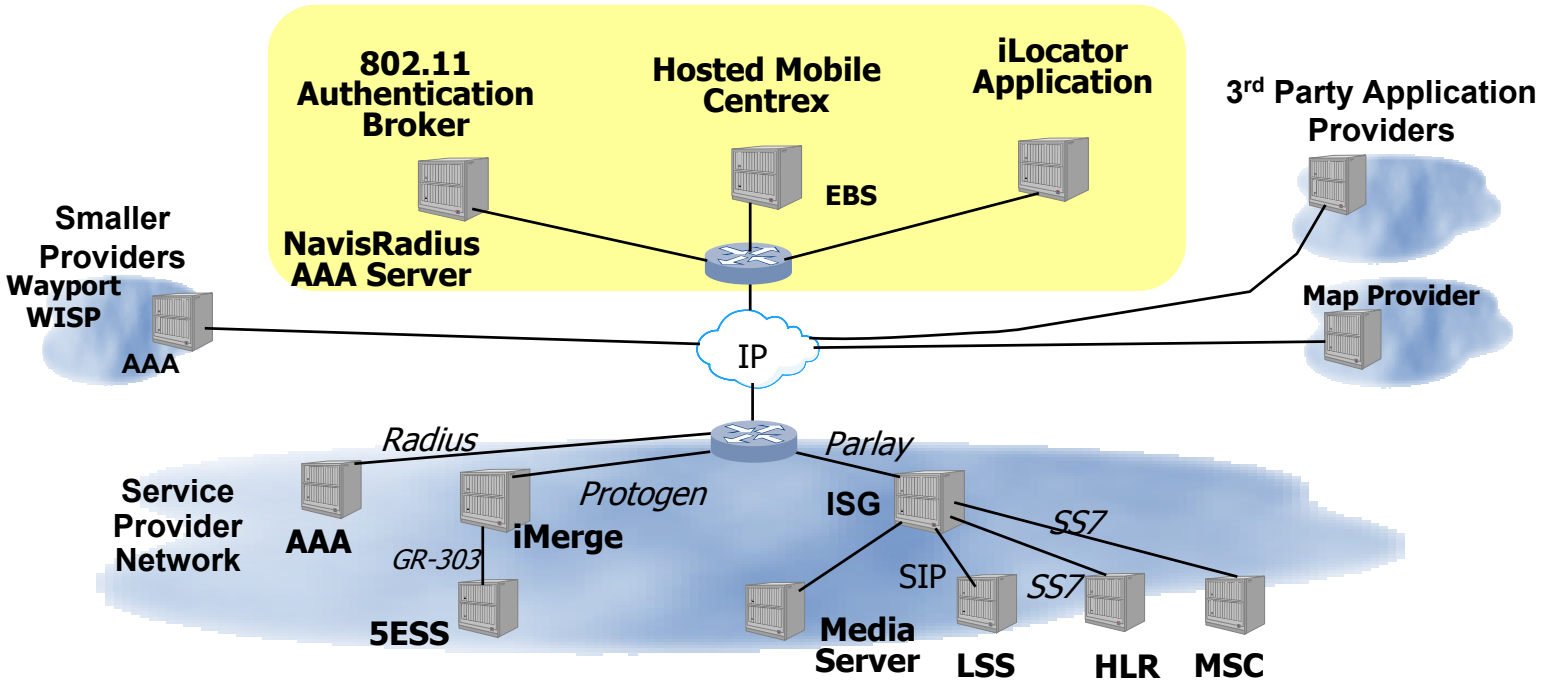
In the Pipeline: Hosted Services

Exploring technologies which can lead to new hosted services

Opportunities under consideration:

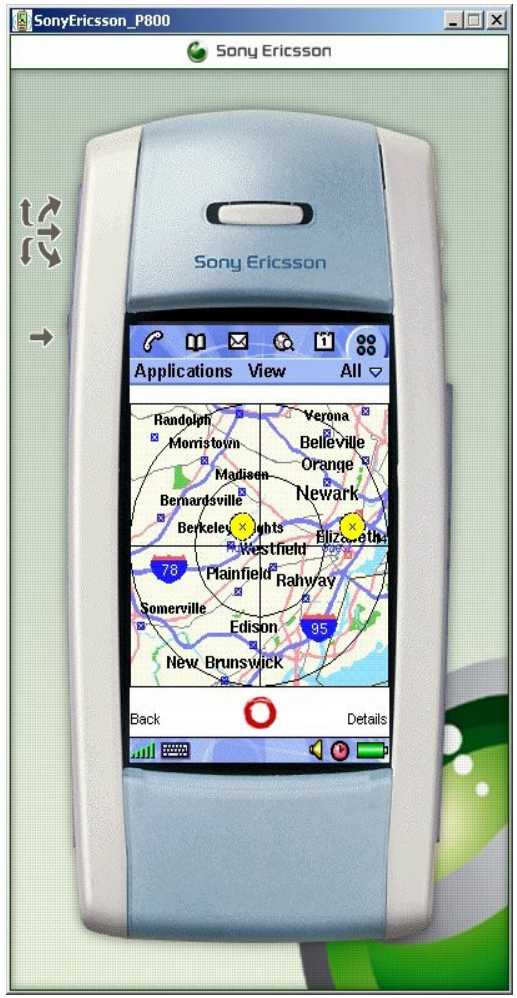
- Medium term: 802.11 Roaming, Hosted Mobile Centrex
- Longer term: Profile Management, Location privacy

Prototype of Bell Labs-LWS Hosted Services Test Bed



In the Pipeline: iLocator

- ***A location and presence-based track and alert application offering multiple services***
- ***Tracks people/events/establishments on a map and alerts when they are in the user's vicinity***
- ***Alert Me: Alert through SMS when the callee becomes available***
  - e.g., John is calling Mary, Mary is busy or has no coverage, network SMS'es John when Mary is again able to receive calls
- ***Provides privacy: users control if they can be tracked and from how far***
- ***Policy-enabled personalization: refine privacy preferences using automatic contexts and buddy groups***



Trial currently underway with major North American service provider

Conclusions

- ✓Designing, building and managing networks are complex issues that require deep thinking
- ✓Bell Labs is developing methodologies, technologies and business models that our customers need to be successful
- ✓LWS is the conduit through which Bell Labs experts are reaching out and working directly with customers
- ✓Bell Labs' mathematicians, physicists, theorists and computer scientists are tackling complex service provider issues

Bell Labs is providing Lucent Worldwide Services with unique competitive advantage