

# Wireless broadband deployment for the digital divide in the City of San Francisco

For under \$4,000 cap costs

June 6<sup>th</sup> 2007

NANOG 40 Lighting Talk  
Tim Pozar

# Problem....

- City of San Francisco is trying to provide broadband to housing developments.
- Incumbent broadband providers do not want to deploy in this area as they “can’t get a ROI”.
  - Although mandated, they do not cover 4% of San Francisco. Guess where that is?









200 Paul Ave.

Alice Griffith

Tim Pozar

# Deployment was going to be too costly

- City could only get bonded DS1s at a total cost of \$1,300 a month.
  - I was quoted an SBC DS1 in a remote area of the Sierra Nevadas for \$500. No break for the digital divide.
- They almost killed the project due to this MRC.

# Solution...

- 5.8 GHz (ISM) 108Mb/s radios
  - From Airaya
- Shooting over the roof tops won't work due to Fresnel Zone clearance.
- Need someone in high places to bounce this off of.
  - This is where the Church of Latter Day Saints comes in... Get it?

























Antenna Location



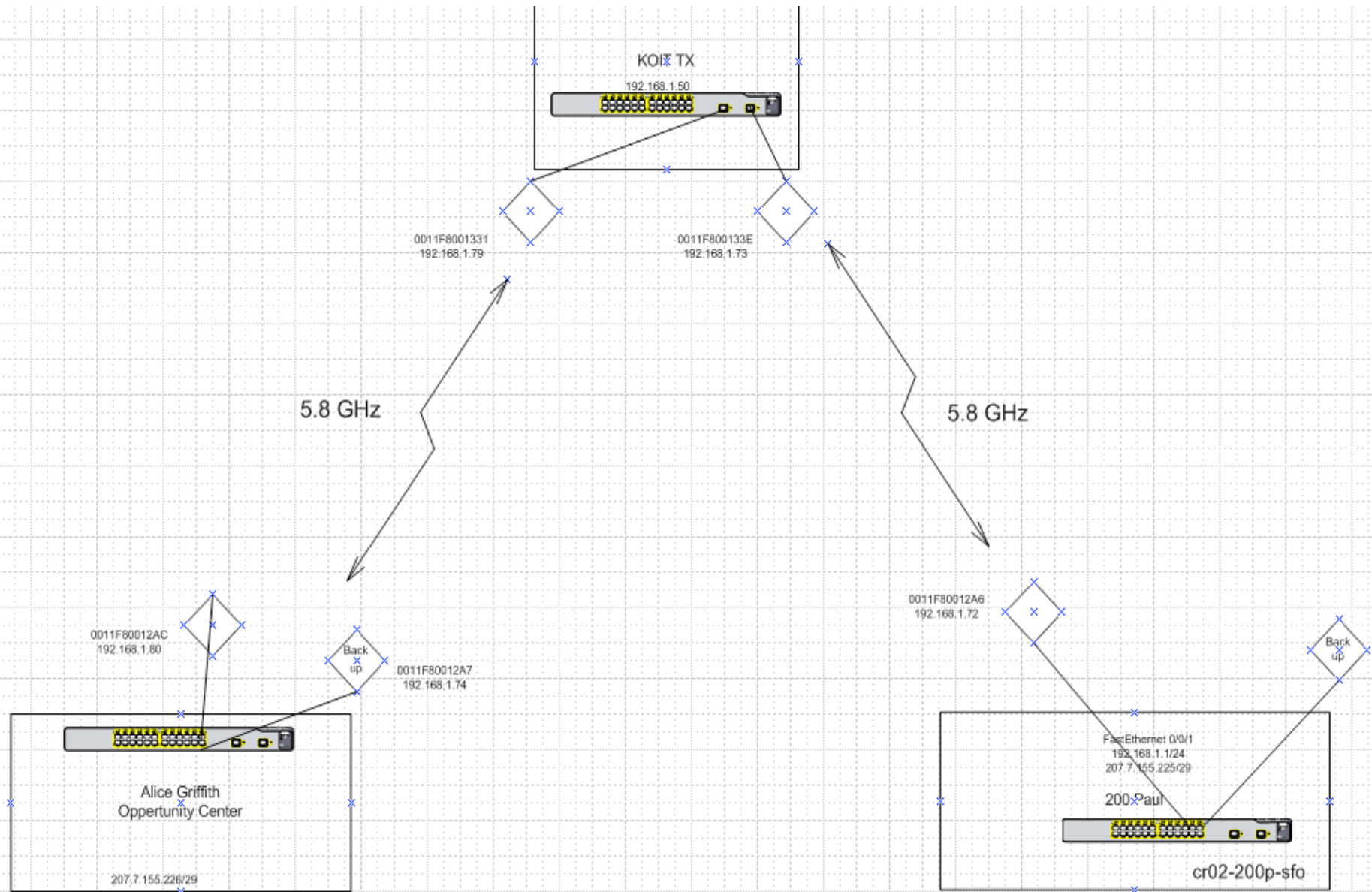



Julia Morgan Designed  
Transmitter Site.  
Built in 1937.



William Randolph  
Hearst 's Examiner Crest

June 6<sup>th</sup> 2007



	REV <b>3</b>	DESCRIPTION	DRAWN							
	Sheet 1 of 1	<b>Alice Griffith Wireless Network</b>	TIM POZAR							
	CHECKED		20070604	Cleaned up	TMP					
			2	20060512	Updated IP addresses	TMP				
			1	20060318	First Layout	TMP				
			NO.	DATE	DESCRIPTION	DWN	CHKD	ENGR	APVD	
			REVISION							
			DATE	20060512						

# Planning and Deployment

- 1st determining if the sight lines would work
  - Pics and computer modeling
- Most of the time was spent with site owners convincing them why this is a good thing.
  - Once convinced, it took months to get through the paper work that the lawyers “needed”.











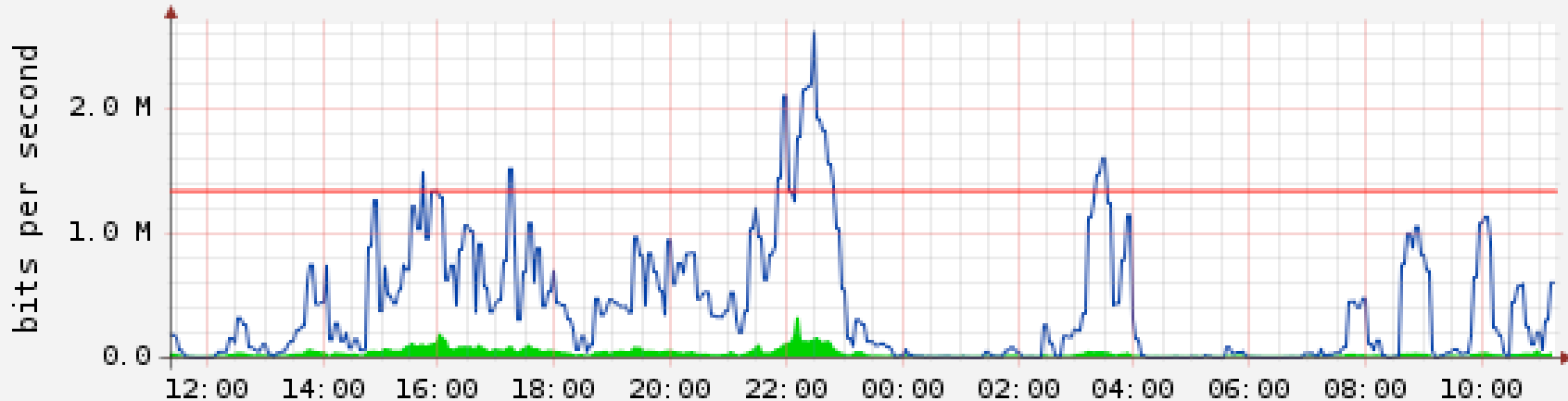




# Monitoring and Bandwidth

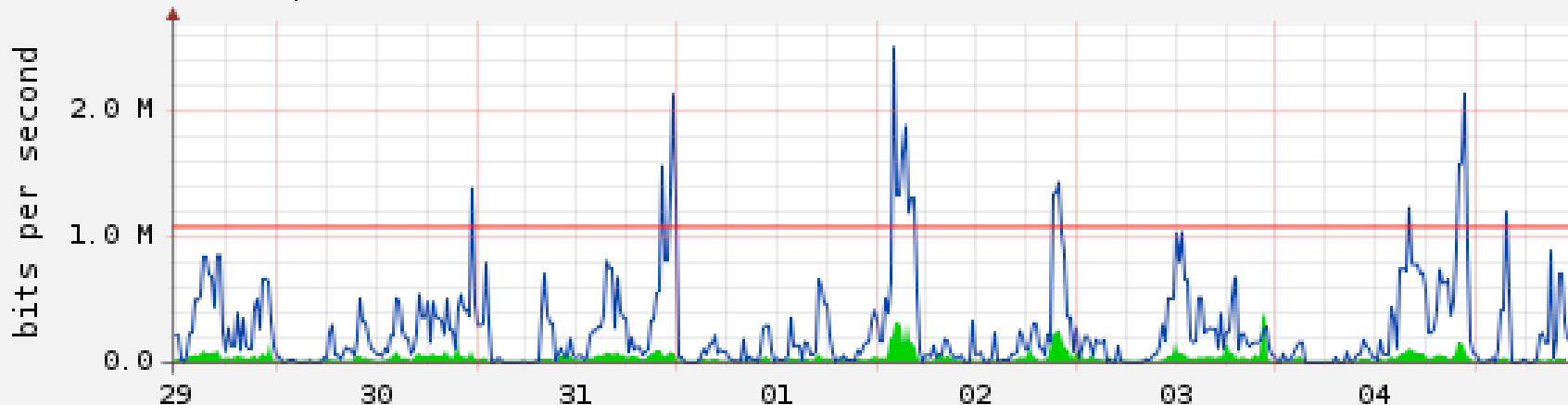
- Almost no different from any other network deployment
- Should monitor C/N or S/N to track:
  - Interference
  - Antenna misalignment
  - Etc.
- We use the standard network tools
  - Cacti and Nagios

### ar07-200p-sfo - Traffic - Fa2 - AG Radio Link P - 207.7.155.225



Inbound	Current: 53.30k	Average: 28.86k	Maximum: 311.02k
Outbound	Current: 888.88k	Average: 401.05k	Maximum: 2.61M
95th Percentile	(1.34 mbit)		

### ar07-200p-sfo - Traffic - Fa2 - AG Radio Link P - 207.7.155.225



Inbound	Current: 26.84k	Average: 32.28k	Maximum: 399.66k
Outbound	Current: 185.84k	Average: 266.86k	Maximum: 2.51M
95th Percentile	(1.08 mbit)		

# Costs

- About \$4K for the radios (SFM OCD)
- Donated switches (UL)
- Donated bandwidth (UL)
- 8 year, \$1 a year lease on the tower site. (BIC)
- The cost of whole installation was recovered in less than 4 months over the AT&T DS1s.

# More to come

- More Housing Developments:
  - Hunter's View
  - Visitation Valley
- Community Centers
- Each added CPE install can be from \$500 to \$1,000.



Questions? And thank you....

Tim Pozar

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