The first step in determining the amount of money available to implement a wireless 911 solution is to establish the period over which the source of funds are required to balance the initial expenditures and recurring operating costs required for implementation.

Fig. 1 can be used as a fairly accurate guideline. Smaller counties and cities may need to choose longer time periods to fund the initial implementation expenditures. For example, for a 5 yr. planning horizon, a city of one million people will have $10 million available to implement and operate a wireless solution if wireless service fees are set at fifty cents per subscriber. The same city would have roughly $15 million available if the service fees are set at 0.75 cents /subscriber (use the .50 cent line and add the .25 cent line to come up with $15 million). Should the time horizon be extended to a 10 year time period, the same city would have $20 million and $30 million respectively if service fees should continue at the 0.50 or 0.75 cent level over 10 years.

Figure 1 could also be extended to estimate statewide revenues by extrapolating the population numbers. For example, if a state were to have a population of 18 million people, a 5 yr. implementation program at .75 cents a subscriber would produce the following calculation from figure 1:

County size = 1 million, service fee= .50 cents, 5 yr. = $10 million
County size = 1 million, service fee= .25 cents, 5 yr. = $5 million

Therefore (adding the above) :

County size = 1 million, service fee= .75 cents, 5 yr. = $15 million

Therefore (multiplying by 18) :

State pop. = 18 million, service fee= .75 cents, 5 yrs= $270 million

If we were to cover the United States:

US population = 350 million, service fee = .75 cents, 5 yrs= $5 billion

By now we should have the 911 service provider's and technology provider's attention. The unique aspect of 911 as a service is that there is very little doubt as to the penetration of the service. When ISDN and CLASS service providers plan implementation of new services, no-one knows for sure whether there will be a demand for the service. This fact separates 911 service from any other service. We know that over the next 5 years anywhere from $2 - 5 billion WILL be spent implementing wireless 911 !!

Bargains: The service levels

Reference to Figure 1 illustrates one unpleasant reality of economics. Regional demographics will have a large impact on the amount of funds available to implement wireless solutions. A county or city of less than 100,000 people may have difficulty funding implementation of Wireless solutions with full LDT (Vehicle Location

Determination Technology - Lat., Long.) unless either a) inordinately long service contracts are signed with service providers (10 or more years), or b) significantly more than .75 cents/wireless subscriber is charged.

The most important demographic variables that affect either the amount of funds available, or the cost to implement FCC's Phase 2 mandates (including LDT) are:

-population,
-penetration of wireless subscribers,
- service fee levels
-geography (size & profile of coverage area),
-wireless population coverage per PSAP, and
-total number of PSAPs to be modernized.

The smaller the wireless population covered, the more difficult it will be to recover the significant implementation costs of vehicle location determination technology, and the required network modernization costs. This does not mean that implementation will not be economically feasible, simply that a phased and/or a "strength in numbers" (planning on a District, Council of Government, and/or State level) approach may be required. We will discuss strategies for implementing wireless for the smaller city/counties later in the paper.

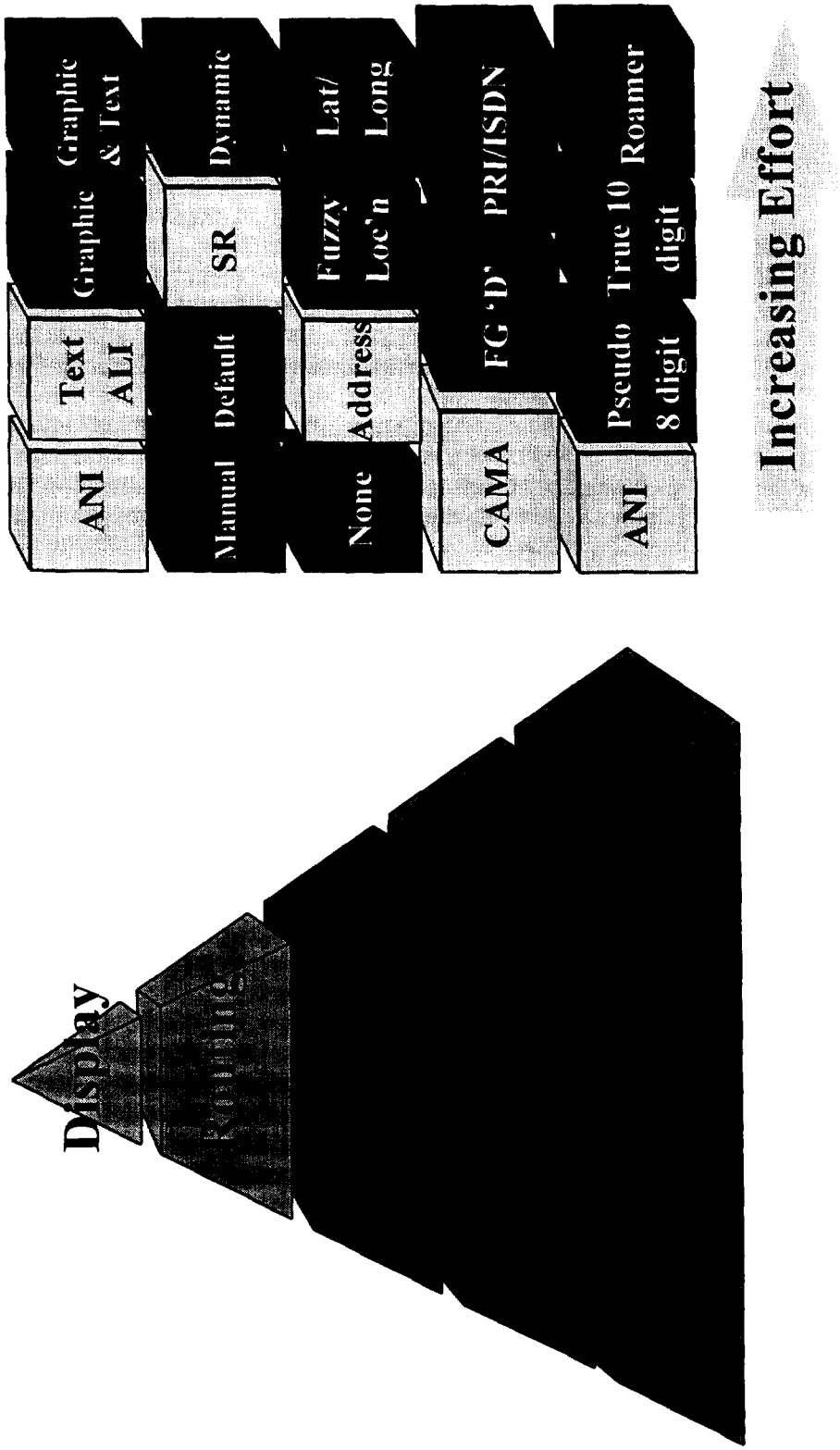
The most significant first step is estimating the most appropriate level of service for the wireless 911 caller. A county of 50,000 with 2 PSAPs and a coverage area of 50 square miles may not need anything more than 10 digit callback ANI and (maybe) 10 digit Antenna pseudo ANI, for effective response to wireless subscribers.

Figure 2 describes the service level that the majority of wireline subscribers enjoy today. In order to provide a perspective for the smaller counties or cities, this analysis considers three different wireless service scenarios:

-Simple 10 digit Callback ANI,
-Fuzzy Location & Callback ANI, and
-full LDT

Details of these service levels are described in Figures 2 a,b,c. These three scenarios were chosen in an attempt to capture a reasonable portion of the spectrum of possible service levels. The cost to implement each service level is significantly different. For example the lowest level: 10 digit callback ANI, as defined in Figure 2a, would require no graphical display, no intelligent workstations, relatively little network/transport/routing changes, and relatively little incremental PSAP administrative overhead. Now that we have defined the "target" service levels, we need to make some assumptions regarding the installed "model" PSAP and network environment, so that we can estimate the implementation costs.

Figure 2 : Service Level Building Blocks



Wireline E-911

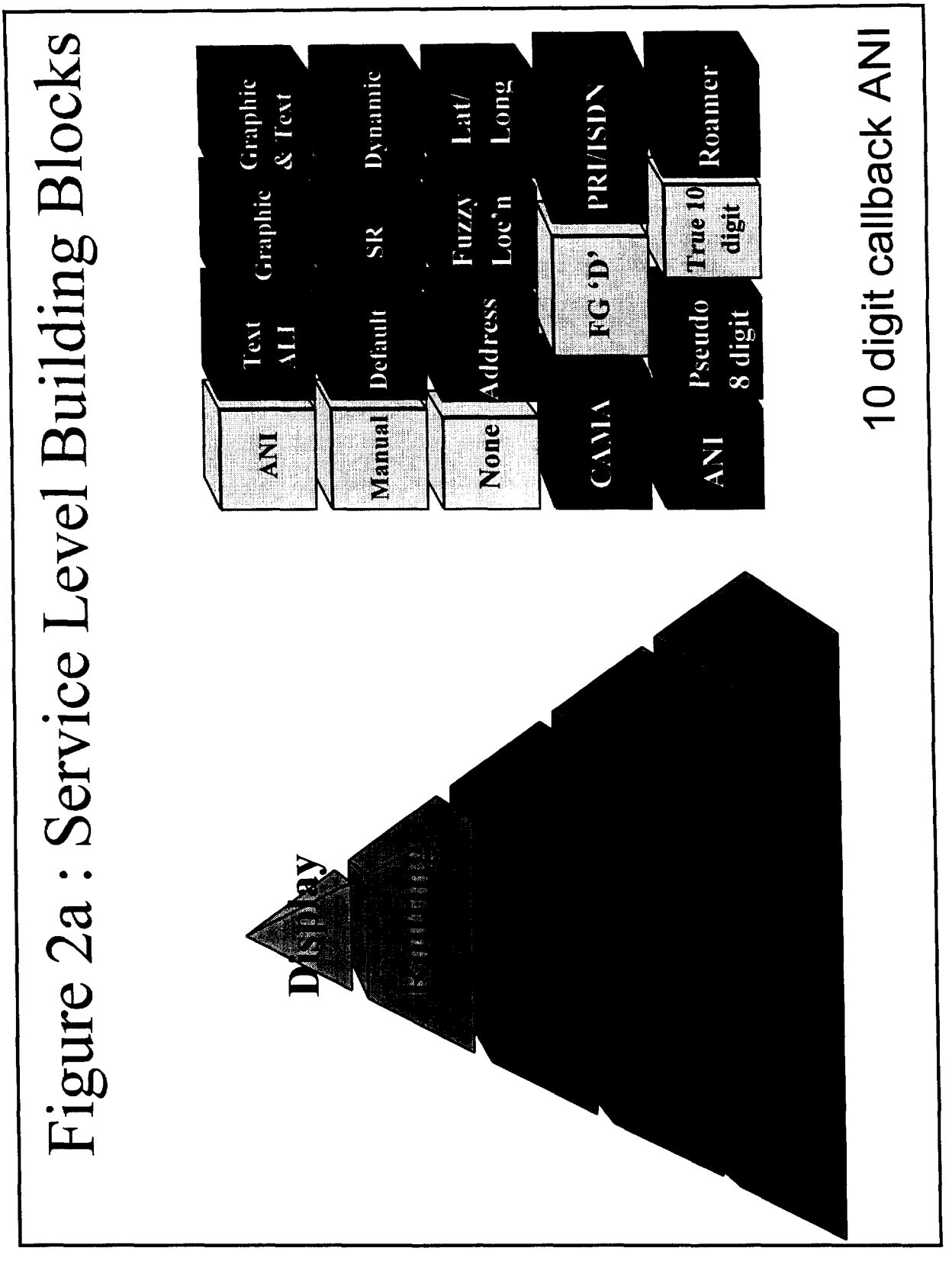


Figure 2a : Service Level Building Blocks
Display
ANI
Text
ALI
Graphic
Graphic
& Text
Manual
Default
SR
Dynamic
None
Address
Fuzzy
Loc'n
Lat/
Long
CAMA
FG 'D'
PRI/ISDN
ANI
Pseudo
8 digit
True 10
digit
Roamer
10 digit callback ANI

Figure 2b : Service Level Building Blocks

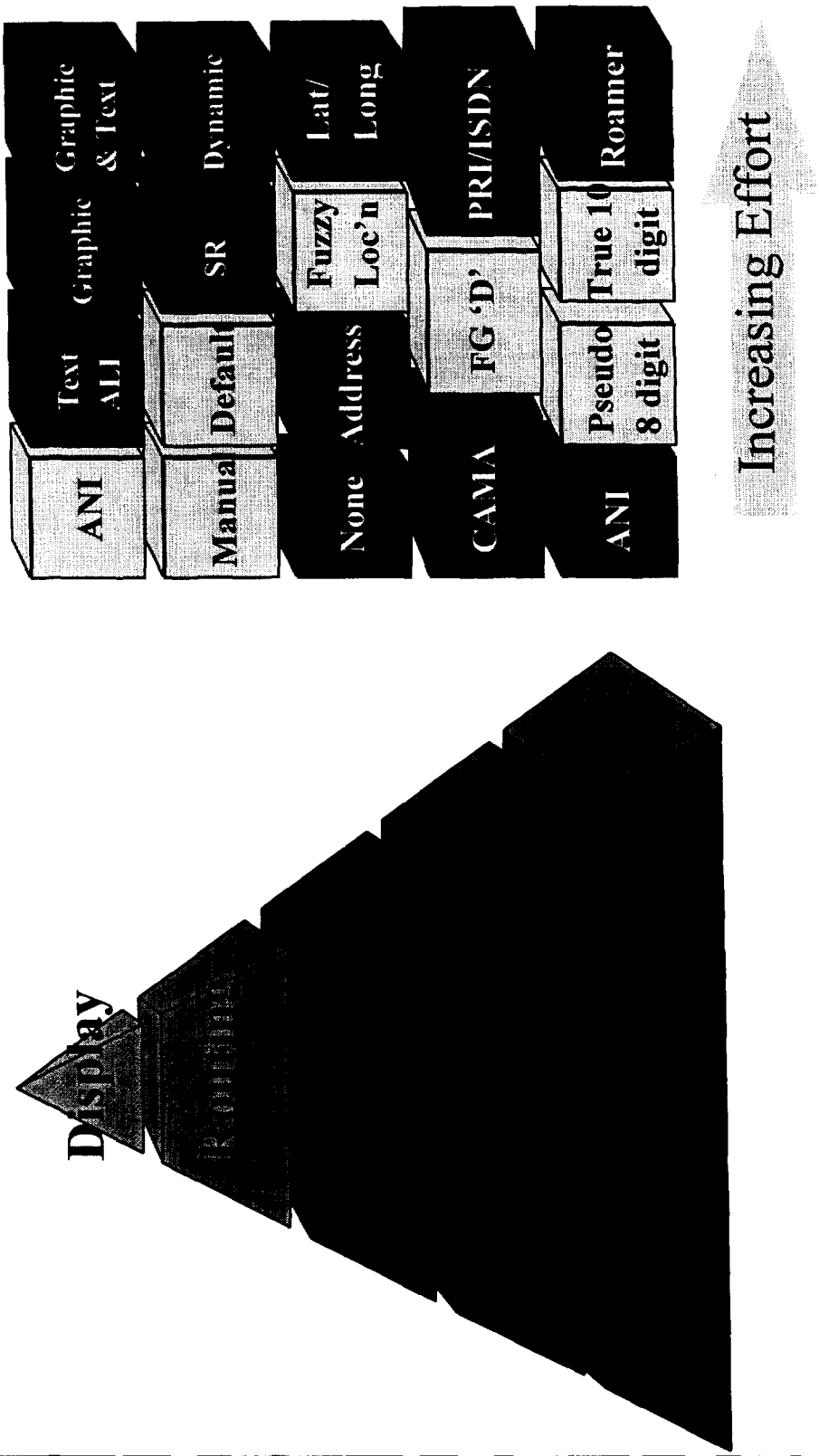
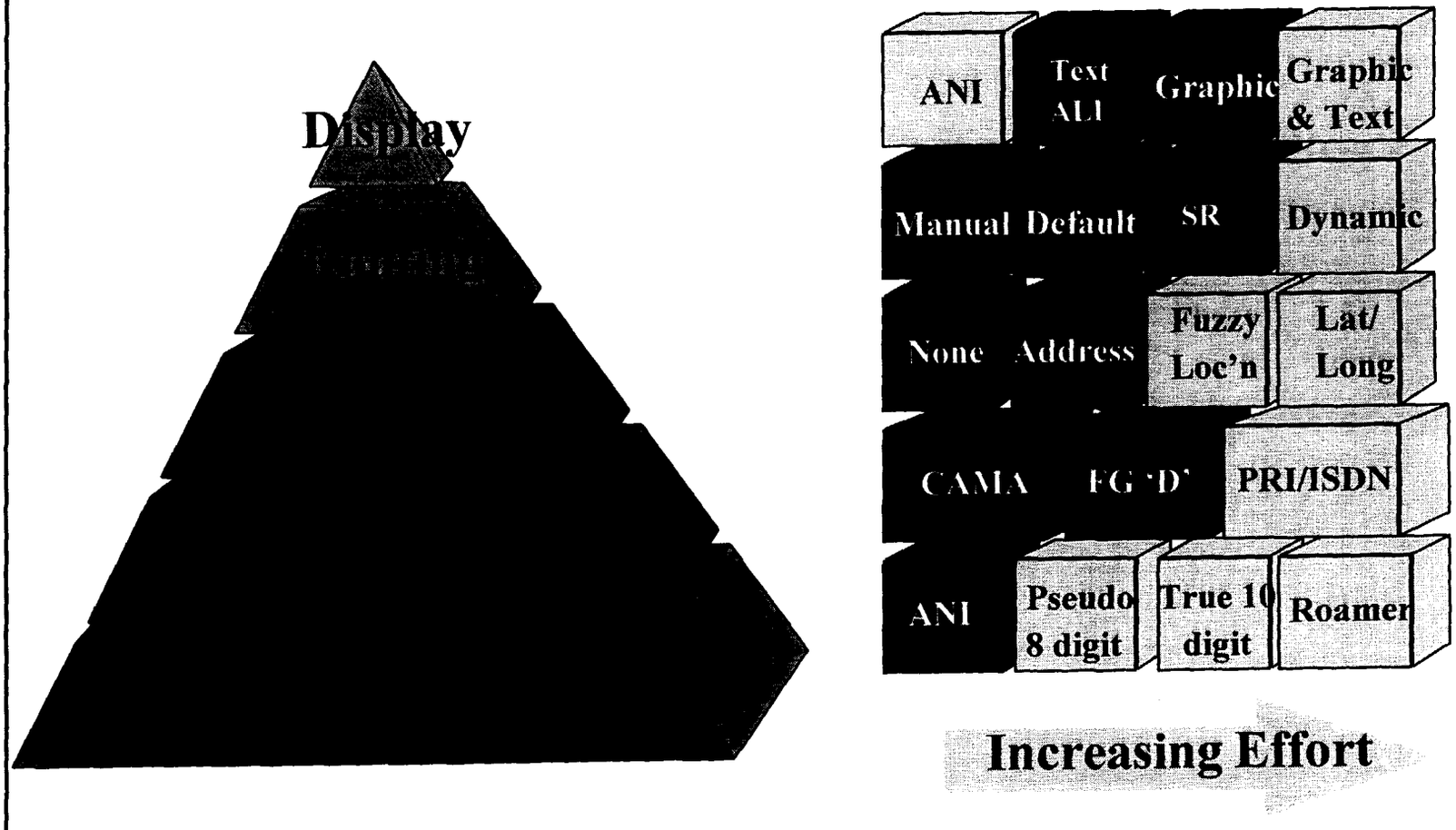


Figure 2c : Service Level Building Blocks



Phase Two Wireless 911

The Food Chain.....Who needs to be fed

Another crucial step in understanding and capturing all the costs associated with implementing a wireless 911 solution, is modeling the overall commerce flow i.e. the flow of dollars and value add. Illustration 1 describes the reference model used in this analysis to identify all the costs associated with implementation.

The Menu.... LDT with ANI, Lat/Long. for $0.75/sub. for 5 yrs.

Once the reference business model, and service levels have been clearly defined, we are well on our way to estimating the implementation costs for the selected service levels. The last reference point that we need to define is our reference PSAP environment.

For simplicity, the reference PSAP is assumed to be a 2 position PSAP serving a population of 25,000 residents, with analog 1A2 key equipment utilizing an 8 digit ANI/ALI controller connected to 2 CAMA trunks and 2 ALI data circuits, served by an E911 tandem office, serving an area of 70 square miles. Using this base reference PSAP model, we can estimate the incremental cost to implement the selected wireless 911 service levels.

We can use this base PSAP building block to construct an aggregate model that consists of a number of the "reference" PSAPs for larger counties or 911 planning areas. For example, a county with 200,000 residents would be served by 8 reference PSAPs. As we get larger and larger collections of reference PSAPs we assume that there will be increasing economies of scale, and cost sharing of incremental operational and administrative costs. Using this modeling approach, a State with 18 million residents would be served by roughly 720 reference PSAPs (18,000,000/25,000).

The model assumes that there will be new 911 trunks implemented to handle the increased wireless traffic. We assume that each wireless trunk required from the 911 service provider will incur the following incremental cost per month per trunk:

Callback ANI - 10 digit trunks - incr. $40/mth/trunk = $80/mth/trk
Fuzzy -10 digit callback+10 digit pseudo ANI - incr. $100/mth/trunk = $140/mth/trk
LDT- 10 digit callback+ pseudo ANI +Lat/Long - incr. $400/mth/trunk = $440/mth/trk

These numbers were selected using the existing tariff in the Texas market as a benchmark ($40/mth/trunk). In reality, the existing trunks connected to our model PSAP will likely be upgraded to provide wireless 911 service. Either way the above new charges are assumed to be applicable for each trunk "modernized" for wireless service.

In addition, network infrastructure modernization costs were estimated based on the demographics of the "reference PSAP", and these costs were extrapolated out to larger county or 911 planning areas. This approach assumes that the 911 service provider will contract with the "wireless" PSAP for a minimum of 5 yrs, and that the first cost of network modernization and the service provider's 5 yr operating costs will be recovered over a 5 year period with a combination of an upfront modernization fee, as well as the new "wireless" per trunk revenues identified above.

As a matter of course, (and in the interest of public safety) it was assumed the 911 service provider / Local exchange carrier's normal recovery period (1-2 yrs) would be extended to 4-5 yrs on the new investment required. From a broad perspective, this seems a reasonable assumption given the historical stance of the 911 service provider's that 911 is not a "big money maker". It can also be safely assumed that the FCC mandate did not intend on positioning incumbent LECs unfairly in the pursuit of the $2-$5 billion dollars that will be made available through new wireless 911 service fees. While these assumptions will no doubt be the subject of many debates between the 911 industry and incumbent Local exchange carriers, we can continue the iterative analysis process with the knowledge that whatever is published here is nothing more than a starting point. Figure 3 provides some insight into the scope of the costs to implement the defined wireless service levels for different county or 911 planning districts. The assumptions used for the model are summarized in Table 1.

Built into the model are CPE modernization costs, incremental PSAP and 911 planning agency administration costs, network modernization and operational costs, as well as geospatial implementation and administrative costs (in the case of Fuzzy and Full LDT). The model assumes that little CPE modernization is required for 10 digit Callback ANI (ANI/ALI controller upgrades), but Intelligent Workstations are required for Fuzzy location and full LDT implementations. It is also assumed that the smaller counties would not require sophisticated tandem office routing enhancements. Routing enhancements for Mobile Identification Number or Lat/Long routing are assumed to be paid for primarily by the larger counties connected to given tandem offices.

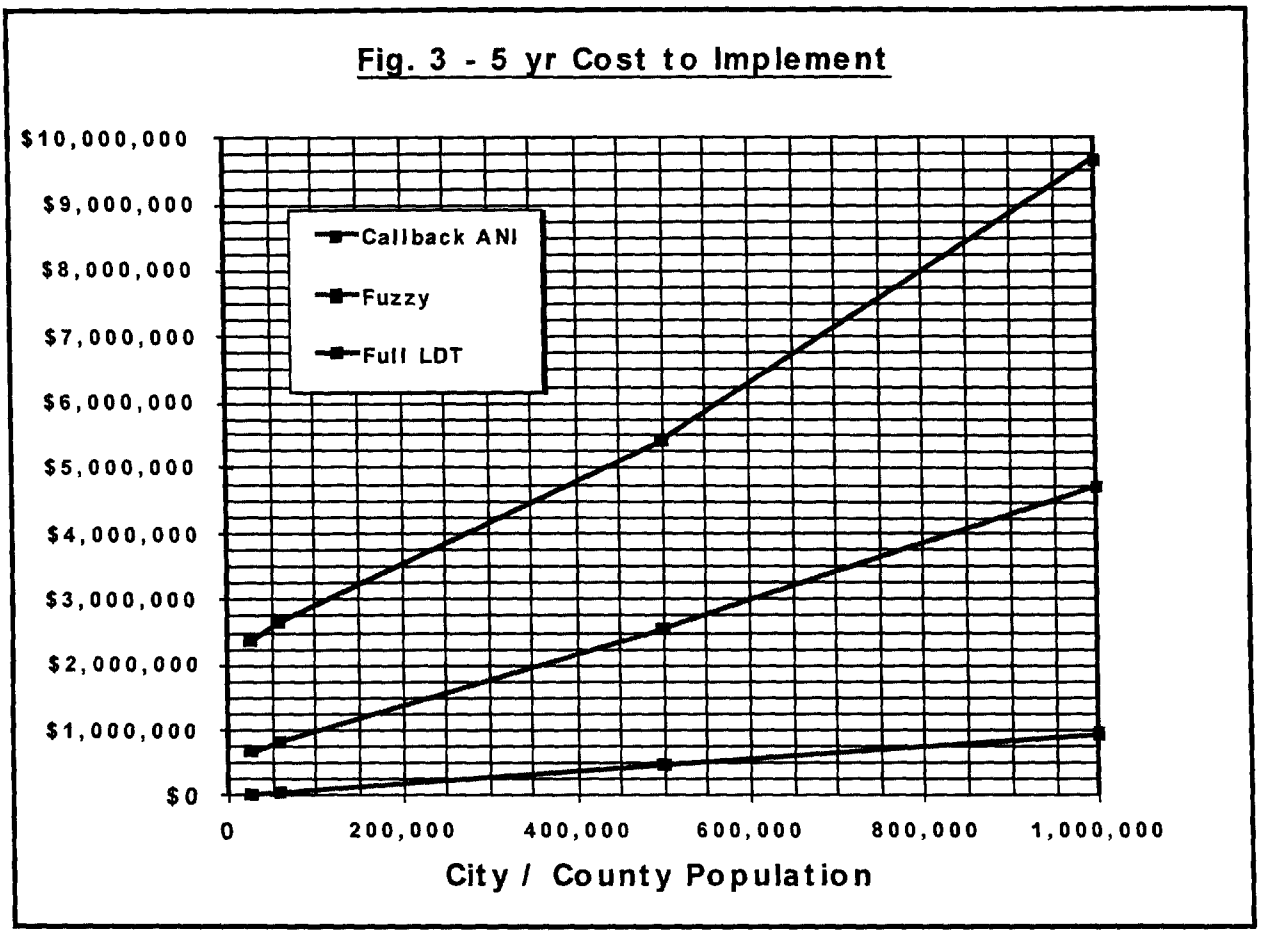


Fig. 3 - 5 yr Cost to Implement
$10,000,000
$9,000,000
$8,000,000
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
Callback ANI
Fuzzy
Full LDT
0
200,000
400,000
600,000
800,000
1,000,000
City / County Population

Table 1 - Cost Model Assumptions

Assume Model PSAP is 2 position Analog Key system with 8 digit ANI/ALi controller connected to CAMA trunks with SR/ALI tandem office

Internal rate of return	10%
Avg. loaded cost/employee	$40,000

City demographics	Avg # of Positions/PSAPs	2	positions				
	Avg. population coverage/PSAP	25,000	people				
	Avg. # of PSAPs / Tandem / office	30	PSAPs				
	population growth	3%	per year				
	Highest Roamer %	5%					
	Avg. population density - Urban	2000	people/sq. mile				
	Avg. population density - Rural	400	people/sq. mile				
	Wireless base % of population - Rural	10%					
	Wireless base % of population-Urban	20%					
	Wireless growth profile	30%	30%	20%	20%	15%	
LDT parameters	Avg. Coverage area/3 LDT antenna	50	square miles				
	LDT OA&M employees/25,000 subs	3	employees				
	LDT cost/ T-span/month	$100					
	LDT-Avg. # of antenna/T1	5	antennas				
	LDT NR installation cost/T1	$2,000					
	NR installation cost / LDT antenna	$500					
	LDT antenna & receiver/antenna site	$50,000					
	Cost for LDT processor	$500,000	per tandem office				
PSAP parameters	Analog key 911 position to IWS upgrade cost	$10,000	per workstation (assume not required for call back ANI)				
	8-10 digit controller upgrade cost	$10,000					
	Geospatial dbase+s/w charges Non recurring	$30,000	(assume doubled for full LDT but not required for callback ANI)				
	PSAP Admin. cost/Wireline sub/yr	$8					
	Incr. PSAP admin cost/Wireless sub/yr	$8	(assume not required for callback ANI)				
	Incr. tariff/ 911 trunk term. -Callback ANI	$40	per month/trunk				
	Incr. tariff/ 911 trunk term. - Fuzzy	$80	per month/trunk	# of PSAP personel/model psap FTEs	5		
	Incr. tariff/911 trunk term. - Full LDT	$400	per month/trunk	Admin. costs/model psap/yr	$200,000		
	One trunk pair every	20,000	wireline subscribers				
	Incr. Geospatial dbase maint.	$20,000	per Model PSAP/ yr - Geospatial accuracy maintenance- Full LDT only				
Telco/Network parameters	10 digit tandem upgrade costs	$300,000	per tandem office				
	Wireless dynamic router -MIN routing	$300,000	per tandem office				
	Wireless dynamic router- XY routing	$500,000	per tandem office				
	router to LDT processor comm costs	$1,000	per tandem/month				
	Incr. database admin costs XY routing	$40,000	per year				

Model Calculations	Model areas	square miles	# of LDT ant.	# of PSAPs	# of PSAP trunks	#of Tandems
	25000	62.5	3.75	1	2.5	0.03
	60000	150	9	2.4	6	0.08
	500000	250	15	20	50	0.67
	1000000	500	30	40	100	1.33

911 Planning Agency	Incr. 911 comm. cost/Wireline sub./yr	0.12	example commission calculation- state of texas	
	911 comm. cost Wireless/Sub/yr	0.12	Est. ALI records	Comm. budget/yr
	Full LDT premium- 50%	0.18	10000000	1200000

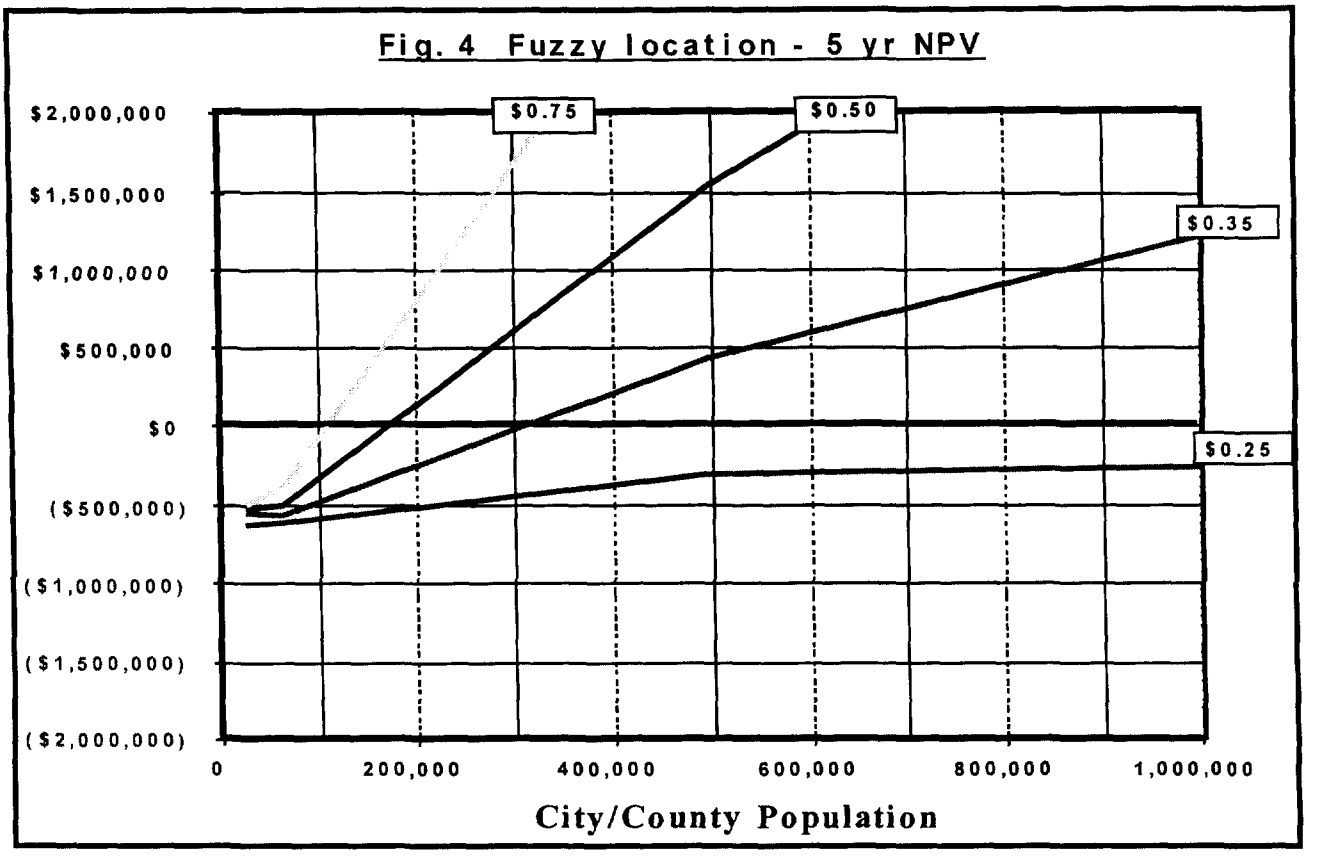
Figure 3 can also be used to estimate the cost to implement Wireless 911 service on a statewide basis. Using our example of a state with population 18 million people, we can multiply the $ 10 million LDT cost estimate for a county size of 1 million to arrive at an estimate of $180 million to implement and operate a 5 year statewide modernization program for the example state.

From our previous efforts (Figure 1), we know that at a service fee between $0.50 and $0.75 per wireless subscriber per month, we would have between $180 - $270 million dollars of funding available. Assuming that our cost estimates are 30-50% too low, then a $0.75 per wireless subscriber per month service fee would provide a reasonable margin of error to plan implementation of an extensive statewide LDT wireless 911 service over 5 yrs.

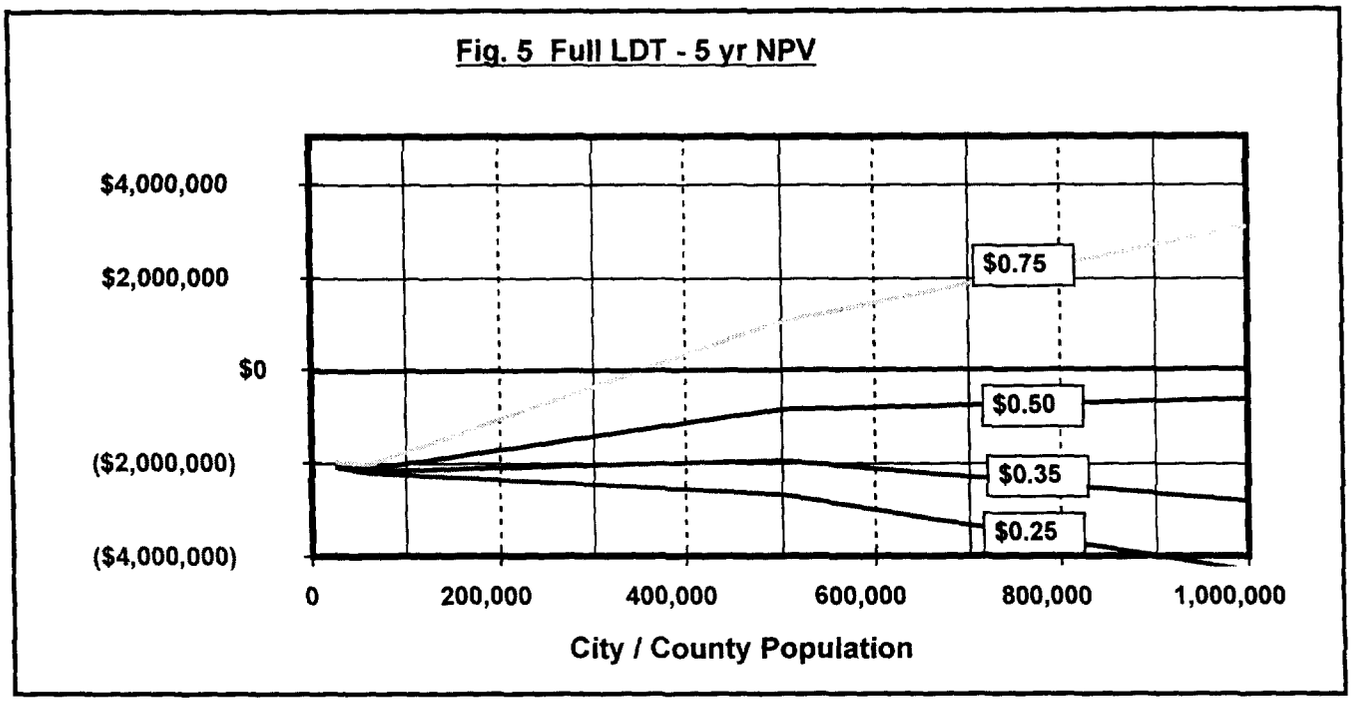
911 Planners can take comfort in the fact that the service fee can be extended at the $0.75 per sub. level until a balanced budget is achieved. More typically, the service fee would be reduced after 5 yrs to an "operating" level that is reflective of the yearly costs to operate and maintain the network, (rather than recovery of the large first install costs).

Pulling it all together

Now that we have calculated both 5 yr revenue as well as cost estimates, we can construct a 5 year cash flow of revenues and costs, and apply a 10% cost of money to calculate the Net present value of each of the implementation scenarios/projects. The results are plotted in figures 4 and 5 for Fuzzy location and Full LDT respectively.



To interpret these diagrams, the goal of the strategic planner is optimally to have a zero balance or Net Present Value over the 5 year program. In other words, the incremental wireless service fees would exactly equal the cost of implementation and operation of the service over 5 years. With this general guideline in mind, there are a number of ways that these diagrams can be used to aid in the strategic planning process.



To set service fees:

The objective is to have a zero or positive budget after 5 years. Fig. 4 shows that at $0.25 per subscriber, implementation of Fuzzy location 911 service level is not possible without a $250,000 - $600,000 shortfall depending on the size of the planning area.

It is important to note that if the NPV line does not appear to be converging toward the zero axis, then the indication is that the service fee is very likely insufficient to offset the ongoing operating cost, and would therefore be very unlikely to be able to support implementation of the service regardless of the planning horizon, or size of the county.

The service planner should only consider NPV curves that have a positive slope, indicating that the service level would converge with the zero line either over longer terms or with an offset funding , or with larger county sizes. Using the above logic, we can extract the following recommendations from figures 4 and 5:

For Fuzzy location:

County Size	Min. service fee - Fuzzy Loc'n	5 yr Offset funding
0-100k	$0.75	$500k-$750k
100k-200k	$0.75	none
200k-300k	$0.50	none
300k-1000k	$0.35	none

For LDT:

County Size	Min. service fee- LDT	5yr Offset funding
0-200k	$0.75	$2,000,000

200-300k	$0.75	$750k-$1000k
300-600k	$0.75	none
600-1000k	$0.60	none

To establish a plan given a set state wide service fee:

Figures 4 and 5 can also be used to help 911 planners understand the likely impact of wireless statewide service fees that have already been determined. Assume that our sample state (pop: 18 million) has set a service fee of $0.50, then figure 4 and 5 can be used to estimate the offset funding required by a planning region to implement a given service level (follow the $0.50 curve to estimate the funds required to make the NPV = O):

County Size	Statewide service fee	5 yr Offset funding - Fuzzy
25k-175k	$0.50	$500k-$200k
>200k	$0.50	minimal NPV >0

County Size	Statewide service fee	5 yr Offset funding - LDT
25k-200k	$0.50	$2.0 M
200k-500k	$0.50	$1.75M-$1.0M
500k-1000k	$0.50	$750k-$0.0

To estimate a "steady state" operating service fee

While the focus of the exercise to this point of the analysis, has been to establish the service fee required to payback both the initial investment as well as the ongoing operating costs, the NPV curves that are parallel to the zero NPV axis provides some insight to a "steady state" operating service fee necessary to provide for ongoing operation of the 911 wireless service after the first 5 yr planning horizon.

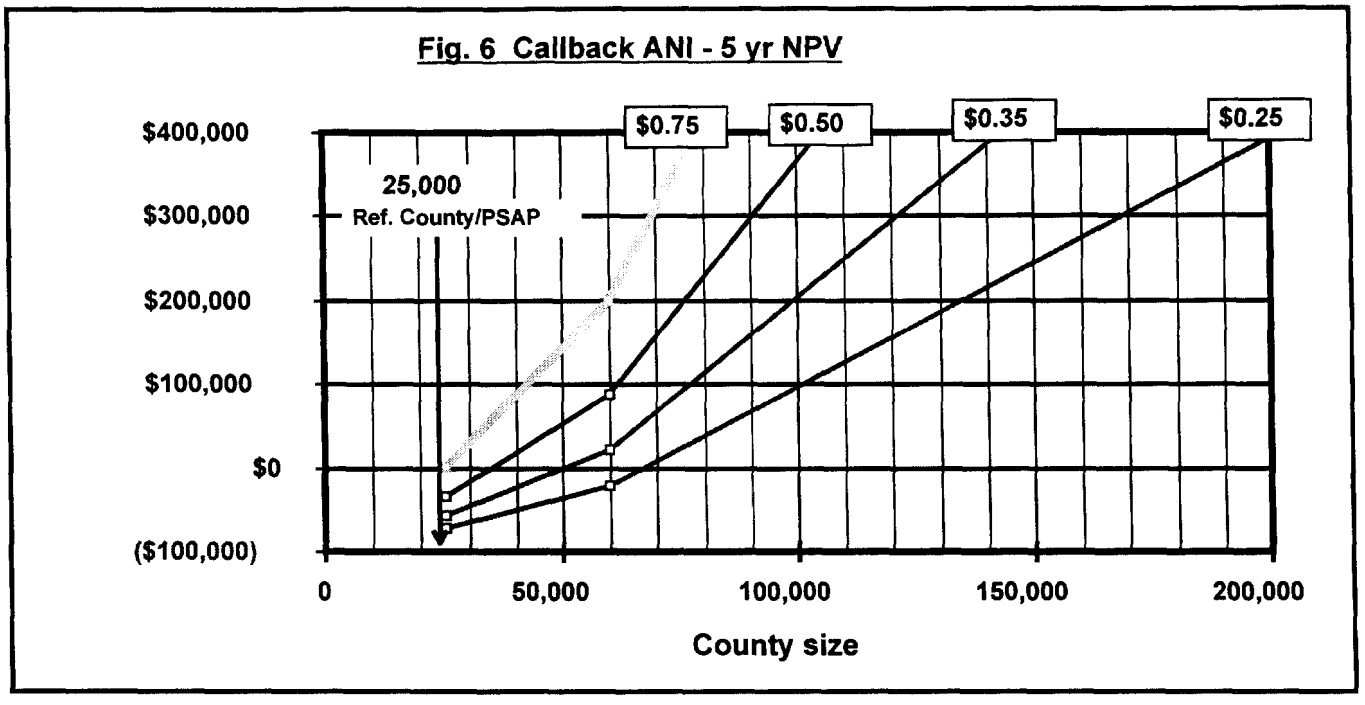
Using this logic, figures 4 and 5 suggest that an ongoing long-term service fee of $0.25 and $0.50 is necessary for maintaining fuzzy location and full LDT service levels respectively (both these curves converge with the 0 NPV axis eventually). It is important to realize that these guidelines are rough estimates that would provide a useful starting point to establishing long-term direction and a strategic plan.

A word about Callback ANI

Figure 6 shows the equivalent curves for the lowest level of 911 wireless service, 10 digit Callback ANI . The above guidelines are applicable to the implementation of simple 10 digit callback ANI. Figure 6 shows that service level fees will pay for the implementation and ongoing operation of 10 digit callback ANI, at even the smallest planning regions. This suggests that a smaller region may be able to use the surplus to plan a phased implementation that would add key service level building blocks, a block at a time.

Reference to figure 2 a, b, & c could help regional 911 planners plan and prioritize the phase-in of critical service level building blocks, as the system evolves from simple 10 digit Callback ANI figure 2 a toward LDT (figure 2 c). For example, a region may begin with delivery of 10 digit callback ANI to a designated PSAP for manual selective routing of wireless calls.

The next service level could involve planning automatic selective routing based on Mobile identifier number, or antenna pseudo ANI as a next logical step of service evolution. The next service level to be phased in may be the delivery of pseudo ANI to the PSAP, and the implementation of integrated workstations for graphic display of the antenna footprint at the calltakers desktop.



Getting down to Cashflows

One benefit of the modeling analysis is to provide the capability to plot the likely cash flow for any given individual data point on the NPV curves. Each point on the NPV curve represents a County or regional planning area with a specific wireless 911 service level, and 911 service fee operating over 5 years. We could plot the profile of costs, revenues , and cashflows over the planning horizon for any of the data points on the NPV curves . Refer back to our sample state (population 18 million).

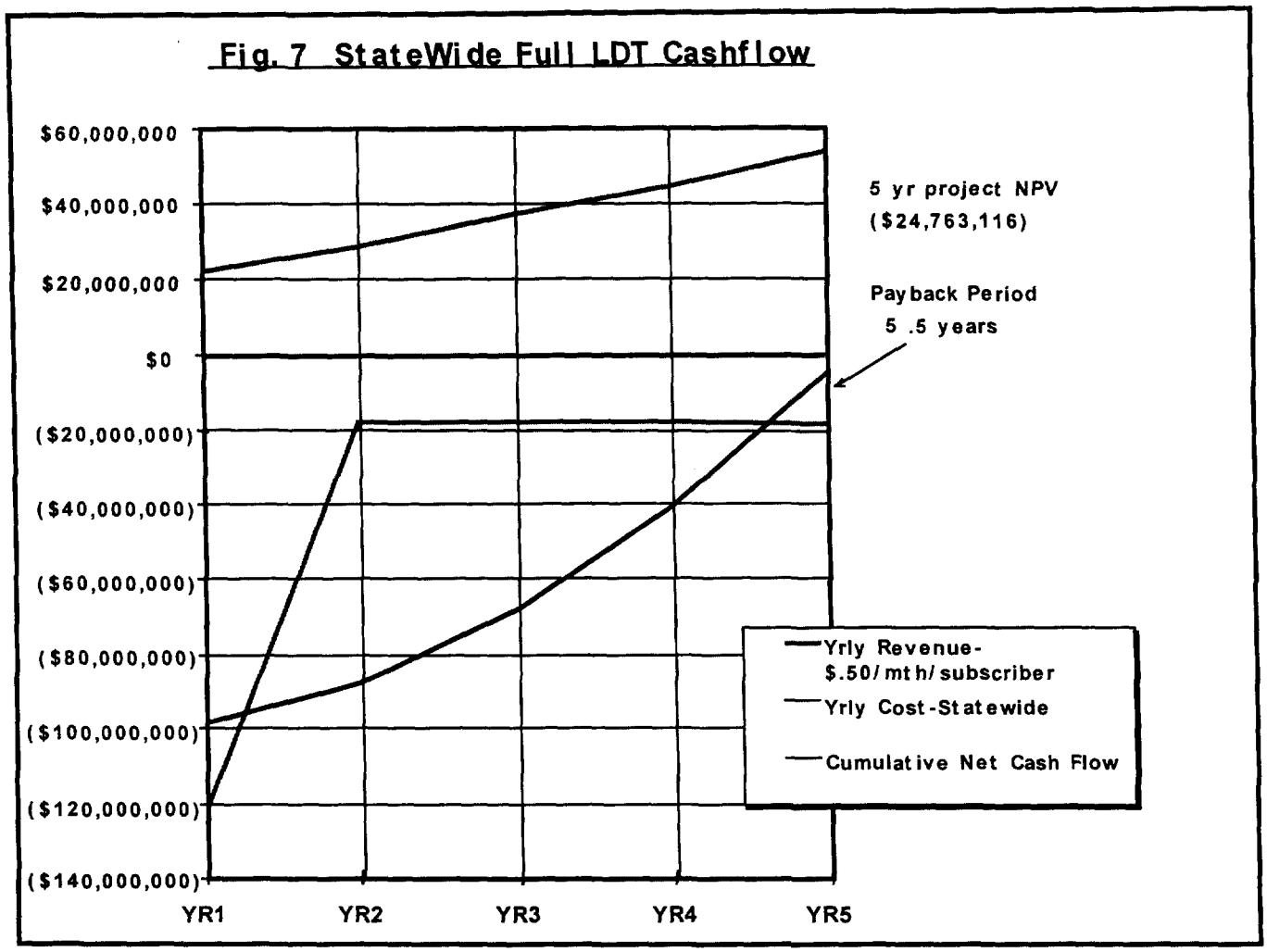


Figure 7 shows the cash flow to implement a statewide LDT program for our sample state. The first year's cost would be roughly $120 million with an ongoing yearly cost of $20 million per year. First year revenues would be roughly $20 million growing to close to $60 million by year 5 (at the $0.50 service fee level).

After 5 years the projected Net Present Value of the cash flows would be negative $24 million. This suggests that a service fee of more that $0.50 per subscriber is required, otherwise $24 million of subsidy is required from wireline service fees. This may be appropriate given that existing modernization programs may already be underway as part of wireline 911 service evolution (e.g. existing Mapped ALI programs, Intelligent workstation upgrades, 10 digit controller modernization, etc.).

The cumulative cashflow (yearly costs minus yearly revenues) finally become positive after year 5, with the project payback occurring after approximately 5.5 years. Referring to figures 1, 5 and 6, would lead us to recommend a starting point of $0.75 per wireless

subscriber for the first 5 years (creating a total of more that $270 million of funding), and a steady state long-term operating service fee of $0.50 per wireless subscriber.

Sensitivity analysis can be performed on any of the variables used in the analysis. For example if the 911 service provider's trunking costs differ from our assumptions, we can easily predict the impact of these changes on the 5 year NPV. Figure 8 shows an example.

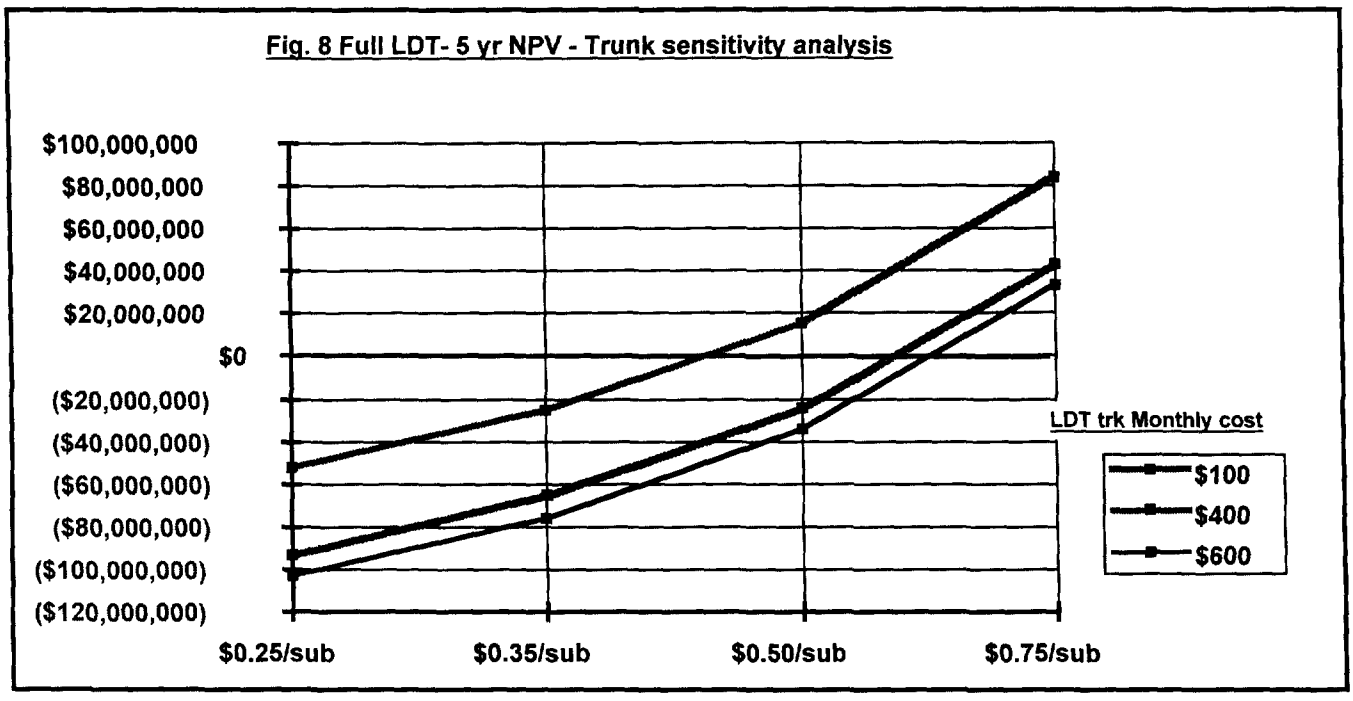


Figure 8 shows the impact on our 5 year NPV if the LDT monthly trunk costs are $600/mth/trk instead of the modelled cost of $400 /mth/trk. Figure 8 shows that the 5 yr NPV would change from minus $24 million to nearly minus $40 million at a service fee of $0.50 per sub per month.

Closing thoughts

We hope that the preceeding summary of the WIP engineering economic analysis has provided useful insight and understanding. As the model and underlying assumptions continue to be refined, and more accurate data becomes available, we expect that the output will be summarized in even more simple and useful formats. Our analysis indicated that a service fee of around $0.75 per wireless subscriber per month would provide sufficient funds to implement vehicle location technology, including appropriate network , routing , geospatial database management and CPE modernization programs. We expect that existing wireline service fees would continue to contribute to modernization programs targeted at addressing the "non-wireless" market forces threatening the integrity of today's 911 service.

And lastly, never give up hope, have confidence,... $5 billion can be a very significant motivating force, ...where there is a dollar to be made someone will find a way!!

GLOSSARY Of TERMS

Relative to Cellular Technology and 9-1-1 Service Delivery

GLOSSARY

Glossary of Terms relative to Cellular Technology and 9-1-1 Service Delivery

Sources: TIA/EIA/IS-93; The Cellular Connection; Newton's Telecom Dictionary

ACM	Address Complete Message (ISUP)
ANI	Automatic Number Identification
ANM	Answer Message (ISUP)
ANSI	American National Standards Institute
AIN	Advanced Intelligent Network
ALI/DMS	Automatic Location Information/Data Management System
AT	Access Tandem
BRI	Basic Rate Interface (ISDN)
CAC	Carrier Access Code
CCITT	International Telegraph and Telephone Consultative Committee
CCS	Common Channel Signaling
CIC	Carrier Identification Code
CNI	Calling Number Identification
COT	Continuity Message (ISUP)
CPE	Customer Premise Equipment
CPN	Calling Party Number
DPC	Destination Point Code (SS7)
DSP	Digital Signal Processor
DSSI	Digital Subscriber Signaling System No. 1 (ISDN)
DTMF	Dual Tone Multi-frequency Signaling
EC	Exchange Carrier
ECSA	Exchange Carrier Standards Association
EIA	Electronics Industry Association
EO	End Office
ESAP	Emergency Services Access Point
ESN	Electronic Serial Number OR Emergency Service Number
EXM	Exit Message (ISUP)
GDOP	Geometric Dilution of Precision
GIS	Geographic Information System
GPS	Global Positioning System
GTT	Global Title Translation (SCCP)
IAM	Initial Address Message (ISUP)

IC	Inter-exchange Carrier
ID	identification or identifier
INC	International Carrier
IS	Interim Standard
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part (SS7)
kb/s	kilobits per second
KP	Key Pulse (MF)
KPV	Key Pulse Variable (MF)
Mb/s	Megabits per second
MF	Multi-frequency
MIN	Mobile Identification Number (IS-41)
MDN	Mobile Directory Number
MSC	Mobile Switching Center
MSU	Message Signal Unit (SS7)
MTP	Message Transfer Part (SS7)
MTSO	Mobile Telephone Switching Office
NANP	North American Numbering Plan
NOC	Network Operations Center
NPA	Numbering Plan Area
NXX	Office Code of the NANP
OPC	Originating Point Code (SS7)
P-ANI	Pseudo - Automatic Number Identification
POI	Point of Interface
POI-S	SS7 Point of Interface
POI-T	Trunk Point of Interface
PRI	Primary Rate Interface (ISDN)
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
RCC	Reverse Control Channel
RDBMS	Relational Database Management System
REL	Release Message (ISUP)
RF	Radio Frequency
RLC	Release Complete Message (ISUP)
RMS	Root Mean Square
RVC	Reverse Voice Channel
SAC	Service Access Code
SCCP	Signaling Connection Control Part (SS7)
SCS	Signal Collection System
SIF	Signaling Information Field (MTP)

SIO	Service Information Octet (MTP)
SP	Signaling Point (SS7)
SS7	Signaling System Number 7 (ANSI version)
ST	Start Pulse (MF)
STP	Signaling Transfer Point (SS7)
TCAP	Transaction Capabilities Application Part (SS7)
TCP/IP	Transmission Control Protocol/Internet Protocol
TDOA	Timed Difference of Arrival
TIA	Telecommunications Industry Association
TLDN	Temporary Local Directory Number (IS-41)
TWLT	Trunk with Line Treatment
UDT	Unit data Message (SCCP)
UDTS	Unit data Service Message (SCCP)
WZ1	World Zone 1

For the purposes of Interim Standard 93 (IS-93) the following definitions are presented.

2-way trunk - A trunk that can be seized at either end.

4-wire circuit - A circuit using separate transmission paths for each direction of transmission.

A-B switch - A switch on your cellular phone (which may be activated by pressing several keys on the keypad rather than being a physical device) that allows you to change between A (nonwireline) and B (wireline) carriers. A or B priority is usually automatic, with the other service being switched to only when the first is unavailable. Some phones allow you to lock them to an A or B carrier. See also Roaming, Nonwireline, Wireline.

A carrier - See Nonwireline.

Access charge - A flat monthly fee charged a subscriber for the use of a cellular system (whether he makes or received any calls or not). Depending on the service plan chosen, this charge may include a number of "free" minutes of connect time. See also Connect time.

Access number - The phone number that must be dialed by someone calling you when you are roaming, prior to dialing the number of your phone. The access number gives the caller access to the facilities of the system in which you are roaming. See also Roaming.

Access Service Area - A geographic area established for the provision and administration of telecommunications service. An access service area encompasses one or more exchanges, where an exchange is a unit of the telecommunications network consisting of the distribution facilities within the area served by one or more End Offices, together with the associated facilities used in furnishing telecommunications service within the area.

Access Tandem (AT) - An EC switching system that provides a traffic concentration and distribution function for inter-exchange traffic originating or terminating within an access service area.

AMPS - Advanced Mobile Phone Service. The official name for the cellular system. Also, an interconnection standard promulgated by AT&T for use in cellular phone equipment.

Analog signal - A signal that changes in a constant fashion, such as voice.

ANI Information Digits - See I Digit and II Digits.

Answer Supervision/Answer Signal - The signaling state of a circuit that indicates idle or busy, on-hook or off-hook status. The signaling state may be indicated in various ways depending on the signaling system.

Antenna - A length of wire that radiates or captures radio signals. In plural form, written as antennas, so as not to be confused with antennae which is the plural form for the protrusion of sensing projectiles from the body of an insect.

Area Code - The first three digits of your phone number (the middle one of which is always) or 1) that identify the part of the country in which it is serviced. The local calling area of your cellular service may include more than one area code. With cellular phones, it is not necessary to dial 1 before entering the area code. See also NPA.

Automatic Number Identification (ANI) - The number that provides the billing number of the line or trunk that originated a call. It is a charge number used to support exchange access and billing. This number may or may not be identical to the Calling Party Number. This the number of the calling station that is automatically forwarded by a switching system.

Band - A portion of the radio frequency spectrum. Cellular communications take place in the 800-MHz region of the UHF band. See also Block, UHF.

B carrier - See Wireline.

Basic Rate Interface (BRI) - In ISDN, the network interface that provides 144 kb/s information transfer as defined in ANSI Standard T1.607.

Billing Telephone Number (BTN) - A telephone number used for billing purposes rather than identifying the actual calling station.

Block (of frequencies) - A group of radio frequencies within a band set aside for a particular purpose. Cellular telephony uses four blocks of frequencies within the 800 MHz portion of the UHF band. nonwireline and wireline carriers are assigned separate blocks of frequencies, as cell sites and mobile units. See also Band.

Burn (a NAM) - To program information into a PROM. The device that does this is called a PROM burner or PROM programmer. See also NAM, PROM.

Calling Number Identification (CNI) - At a minimum, the CNI includes a single Calling Party Number. It may also include a second Calling Party Number, a calling party subaddress, and redirecting number information.

Calling Party Number (CPN) - A set of digits and related indicators that provide numbering information related to the calling party. It is the identification number of the party originating a call.

Carrier - A company that provides telephone (or another communications) service. Also, an unmodulated radio signal. See also Nonwireline, Wireline.

Carrier Access Code (CAC) - The digital code that is used to obtain access to the switched services of an IC or INC. The notation CAC represents the sequence of digits of any of the one or more Carrier Access Codes used in this Interim Standard. This sequence is of the form 10XXX, where XXX is the 3-digit Carrier Identification Code (CIC). Unless specifically indicated otherwise, the CAC and CIC notations shall also represent the 101XXXX Carrier Access Code, where XXXX is the associated 4-digit Carrier Identification Code.

Carrier Identification Code (CIC) - The digital code that uniquely identifies each IC or INC. A CIC applies to an IC throughout the North American Numbering Plan area. Multiple CICs per carrier are not precluded.

CDMA - Code Division Multiple Access - A digital cellular technology that tags digitized segments of a conversation with a unique code. This permits the segment to occupy a broad range of frequencies, to be identified and re-assembled into voice at the other end by having the correct code. This mechanism allows even greater channel capacity than TDMA. See also TDMA.

Cell - The area assigned to a fixed-location cellular transmitting and receiving station. Each cell in a cellular system uses a pair of frequencies, to a maximum of forty-five, specific to it (within a region). The traffic from a mobile telephone is switched from cell to cell as the phone moves out of one and into another. See also Cell site, Handoff.

Cell Site - Where the fixed end of a cellular link is located. Also, the equipment used there. See also Cell.

Cell Splitting - Dividing one cell into two or more new cells to provide additional capacity within the original cell's region of coverage.

Cellular - Made up of cells; using cellular phone technology.

Cellular Carrier - A carrier authorized to provide cellular mobile-radio communications exchange services.

Channel - A frequency pair. There are currently 832 channels (including those for control signals) assigned to cellular use. See also Control signal, Frequency Pair.

Chip - See IC.

CLEAR Key - The key you press to erase information entered by mistake into a phone's memory. See also Memory.

Clock - A source of timing reference for digital equipment.

Coaxial Cable (coax) - A type of cable used to carry signals in radio and other electronic communication, It consists of a center conductor surrounded by a cylindrical layer of insulation, which, in turn, is covered by a tube of braided copper wire or of thin foil. The whole is encased in a layer of protective insulation. The cable in cable TV is coaxial cable. See also Hard line.

Common Channel Signaling (CCS) - A signaling method utilizing a separate path from the voice path which carries signaling messages pertaining to a number of circuits.