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VoIP – Closing the Voice Quality Gap
提高 VoIP 的话音质量

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ADAPTIVE DIGITAL TECHNOLOGIES, INC.

Adaptive Digital Technologies, Inc
公司简介

- Established in 1994 创立于一九九四年
- Specializing in DSP algorithms for Telecom and Voice Quality Enhancement
  致力于通讯领域的数字信号处理算法和语音质量增强技术的研发
- Offices in suburban Philadelphia and San Jose 公司所在地：费城和硅谷
- Distributor of Video

VoIP–Closing the Voice Quality Gap
提高 VoIP 的话音质量

- VoIP vs. Legacy Telephone Network
  VoIP网络和传统电话网络
- VoIP Impairments 缺陷
- Overcoming VoIP Impairments 克服缺陷
- Taking VoIP Beyond Legacy Performance
  超越传统网络的性能
- How Integrated DSP Software Can Help
  集成的DSP软件方案
- Demonstrations 演示

VoIP vs. Legacy Telephone Network

Feature	Legacy 传统	VoIP IP 网络
Switching 交换	Circuit 电路	Packet 包
Network Reliability 网络可靠性	High 高	Varies 不确定
Delay 延迟	Low 低	Varies 不确定
Vocoder 压缩编码	G.711 PCM	Selectable 可选多种

VoIP Impairments
VoIP 的缺陷

- Delay, Delay Jitter, Out of Sequence Packets
  延迟，包次序混乱
- Packet Loss 包丢失
- Echo 回声
- Vocoder 压缩编码

Step 1: Overcoming VoIP Impairments
克服VoIP的缺陷

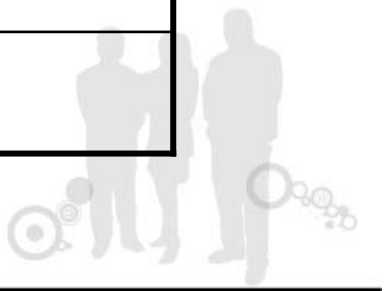
- Delay -> Jitter Buffer
  延迟 -> 存储缓冲
- Out of Sequence Packets -> RTP, Jitter Buffer
  包到达次序混乱-> 实时传输协议，缓冲
- Packet Loss -> Packet Loss Concealment
  包丢失 -> 包恢复技术
- Echo -> Echo Cancellation
  回声 -> 回声抵消
- Vocoder -> Use G.711 or better?
  压缩编码 -> 使用G.711 或更好压缩算法?

Step 2: Taking VoIP Beyond Legacy Performance
超越传统网络的性能

- Wideband Audio
  宽带信号
- Algorithm Optimization
  信号处理算法的优化

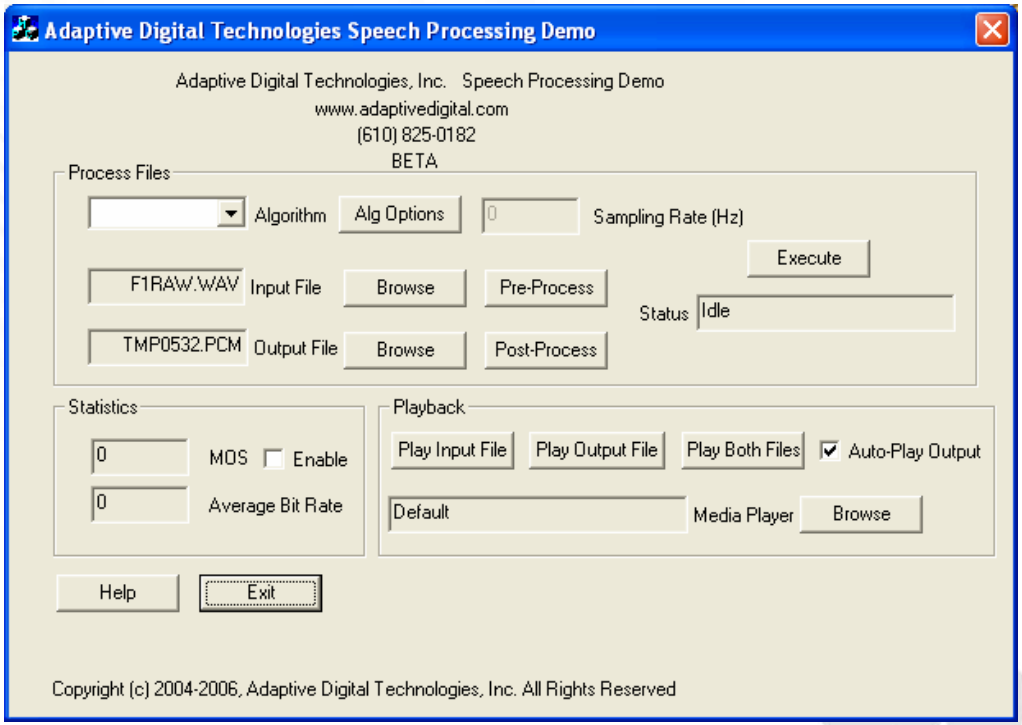
Wideband Audio
宽带声音信号

Algorithm	Audio BW (kHz)	Bit Rate (kbps)	MOS
G.711	3.4	64	4.0
G.722	7	64	4.2
G.722	7	48	4.14
G.722.1	7	32	4.0
G.722.1	7	16	3.7

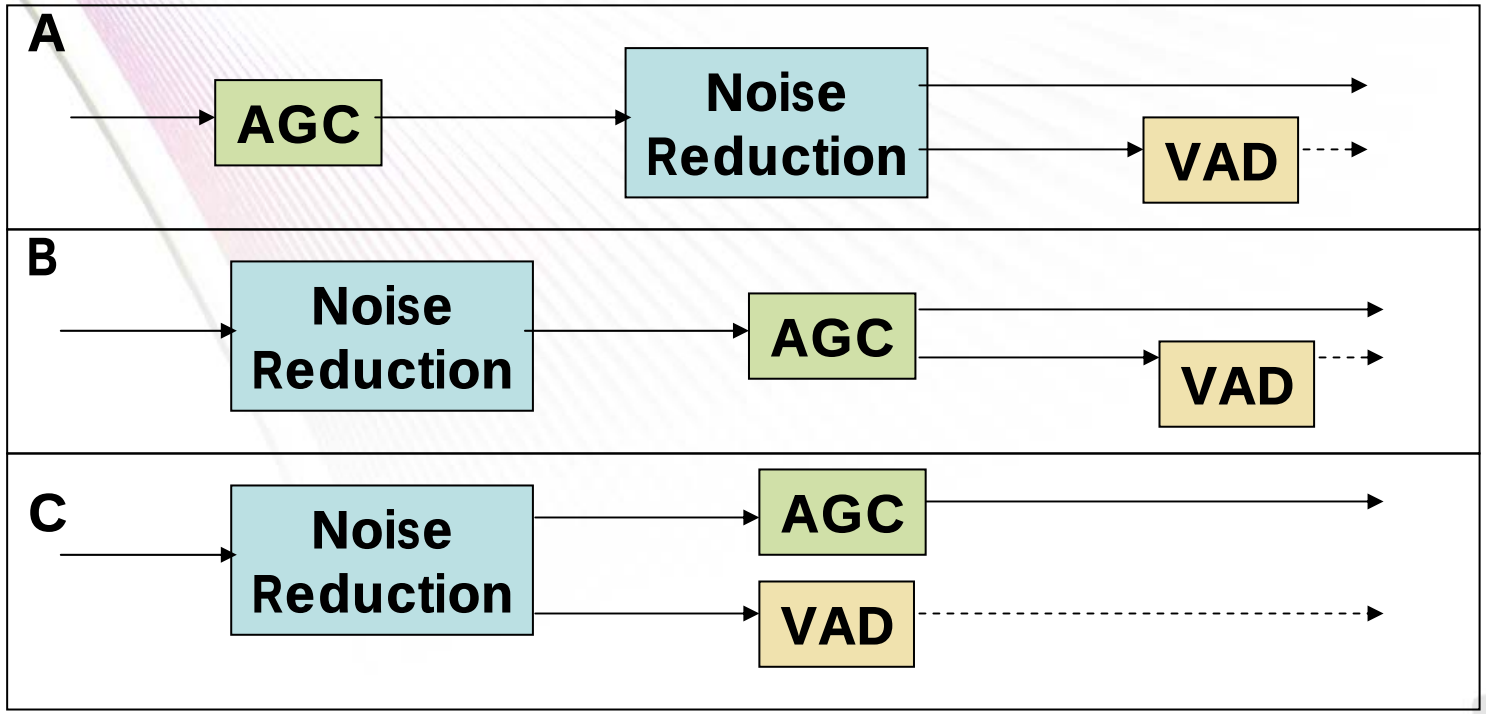


Voice Processing Demo
语音信号处理演示

- PC Based
  PC 演示软件
- Free to use
  免费使用



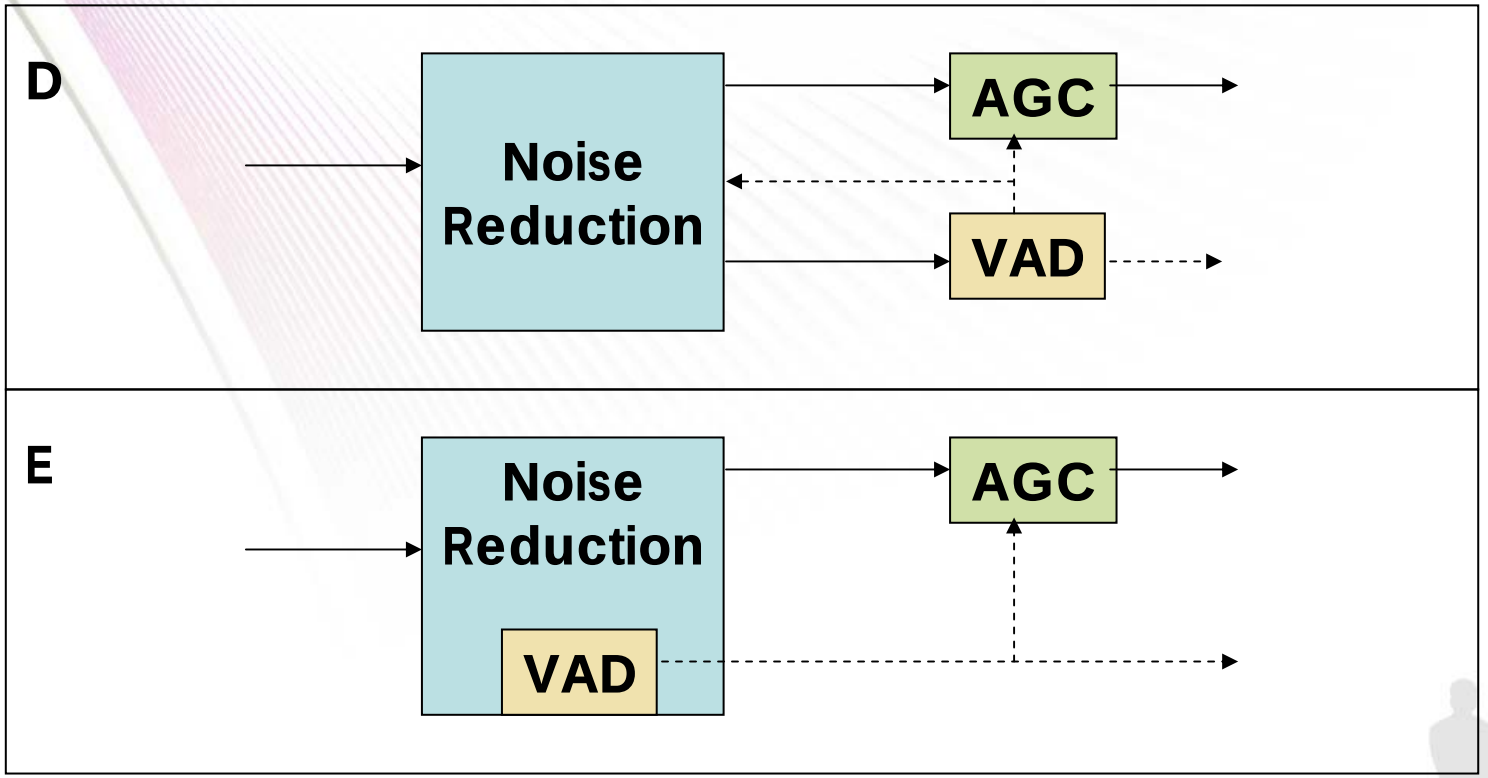
Algorithm Optimization
信号处理算法的优化



What happens when adaptive algorithms run together?

Which option is best – A, B, or C?

Algorithm Optimization
信号处理算法的优化



How about option D or E?

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Conference Application
应用举例：电话会议系统

Integrates Many Dynamic Algorithms 算法集成

- Echo Cancellation (AT&T Certification!!) 回声抵消
- Noise Reduction 噪声抵消
- Noise Suppression 噪声抑制
- Voice Activity Detection (VAD) 话音检测
- Automatic Gain Control (AGC) 自动增益控制
- Dominant Speaker Selection 强拣选

Proper integration and inter-working is fundamental to attaining optimum voice quality

正确集成与整合是获得最佳话音质量的基础

Algorithm Optimization
算法模块的优化

Q: When do we get the best voice quality?

什么时候得到最好的话音质量?

A: When algorithms work together by:

a. Sharing internal data
共享内部数据
AND / OR 和/或

b. Calling each other as necessary
必要的互相调用

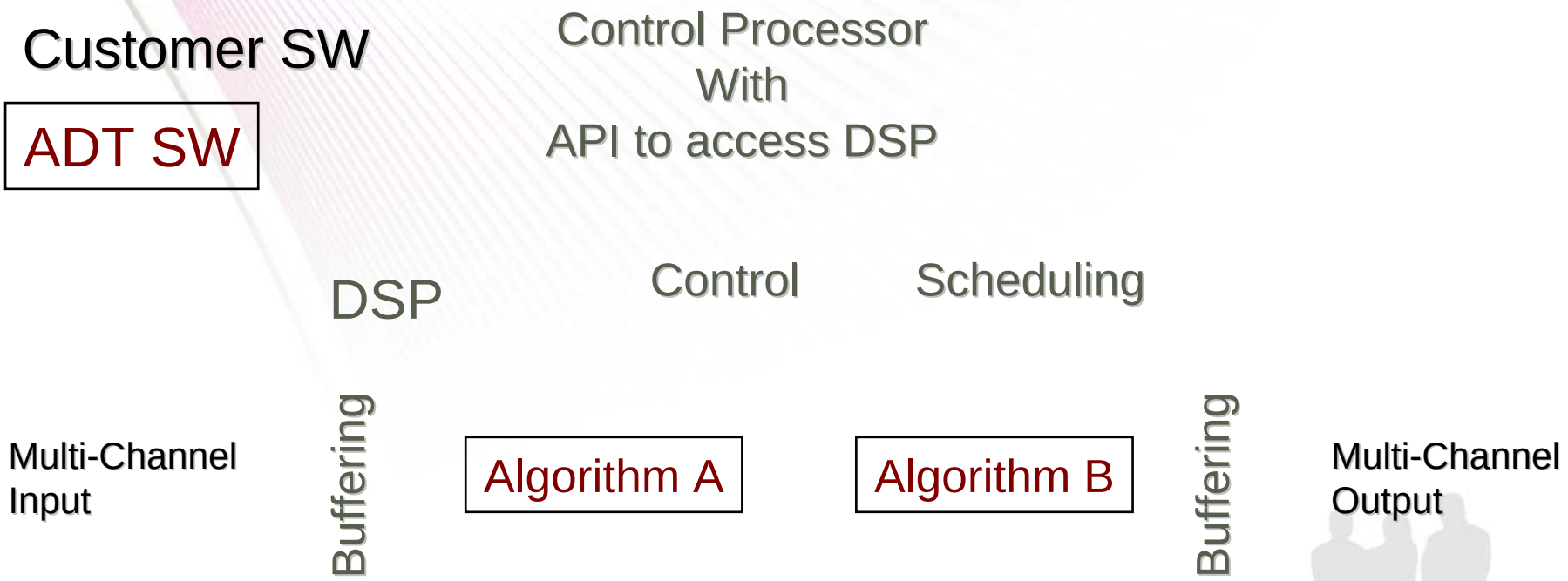
Nuts and Bolts – Applying the Ideas
算法模块的链接 – 如何化为现实

- How do we ensure proper algorithm interaction?
  如何确保算法模块间的正确互联？
  - Offer algorithms that are already integrated together. What's the limitation?
    固化好的模块组合。局限？
  - Offer algorithms that are designed to work together. (Options D and E from earlier slide)
    提供容易互联的算法模块
  - Application Specific Signal Processor (DSP + Software Image)
    面向应用信号处理器：DSP+软件

Application Specific Signal Processor (ASSP)
面向应用的信号处理器（ASSP）

- ASSP=DSP+Downloadable Software Image
  ASSP = DSP + 可载入软件
- Application is designed with algorithms properly integrated and working together
  软件使用集成模块
- No DSP programming required
  无需DSP编程
- API for host GPP provided to simplify interface
  简单易用的控制器编程接口

Algorithms vs. ASSP
处理模块与面向应用的解决方案

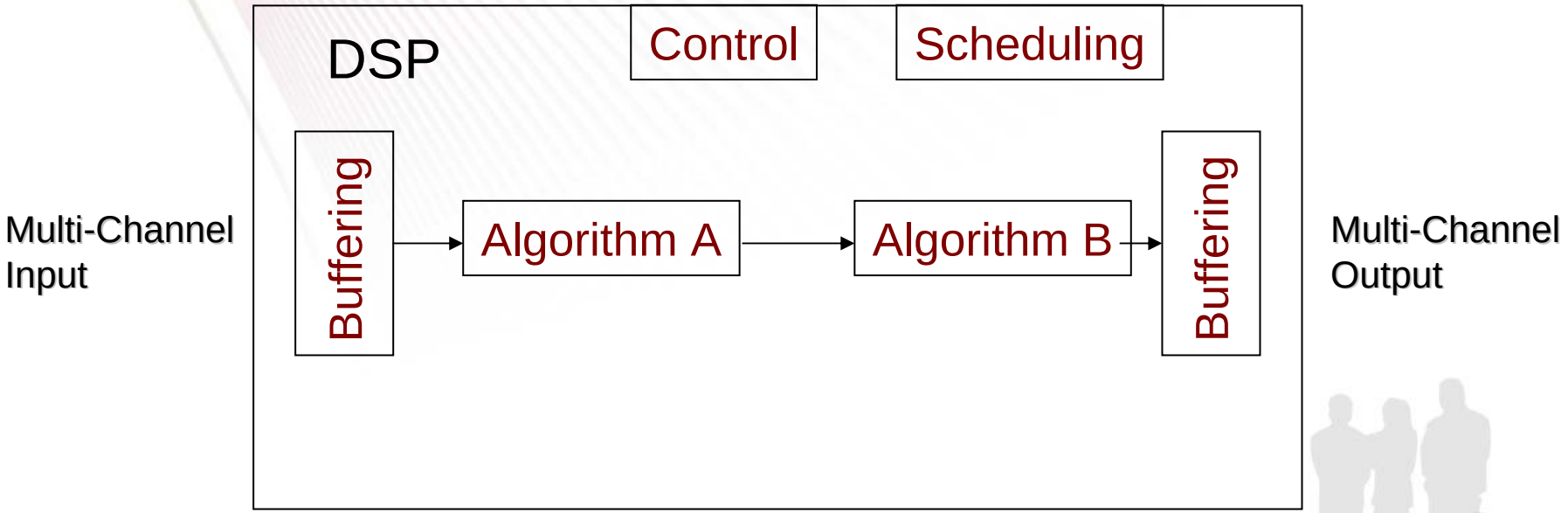


ASSP vs. Algorithms

Customer SW

ADT SW

Control Processor
With
API to access DSP



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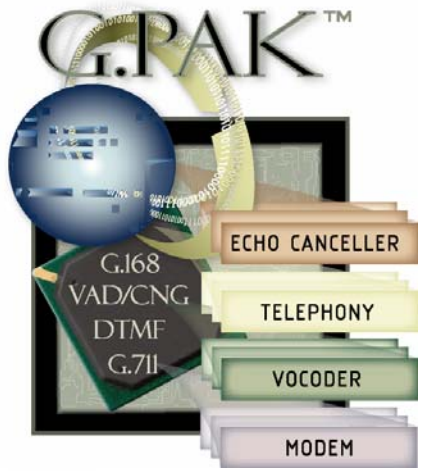
ASSP Examples
ASSP软件实例

- ipPhoneChip – (reference kit available)
- 512 Channel Conferencing Chip – C6416
- G.PAK VoIP
- 128 Channel Echo Canceller (C6424)
- 32 Channel Echo Canceller (C5510)
- 8 Channel Echo Canceller (C5507)
- IP PBX (C5510)
- Hands-Free VoIP Intercom (C5507)

G.PAK™



- Rapidly builds ASSP software

  快速生成ASSP软件

- Configured at build time with customer options

  生成软件时可配置用户选项

- ANSI ‘C’ Software API for Host processor

  提供控制器端C 语言程序接口

DSP Resource Wizard™

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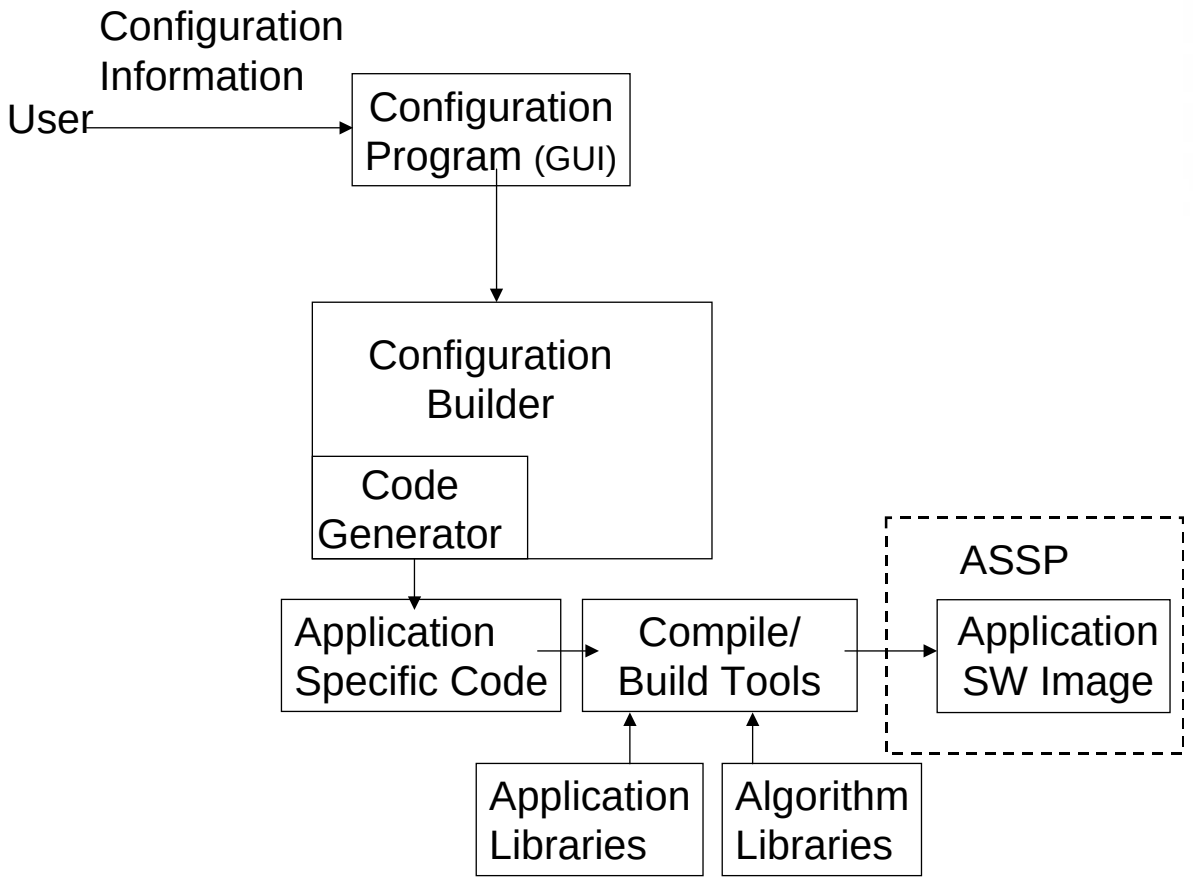
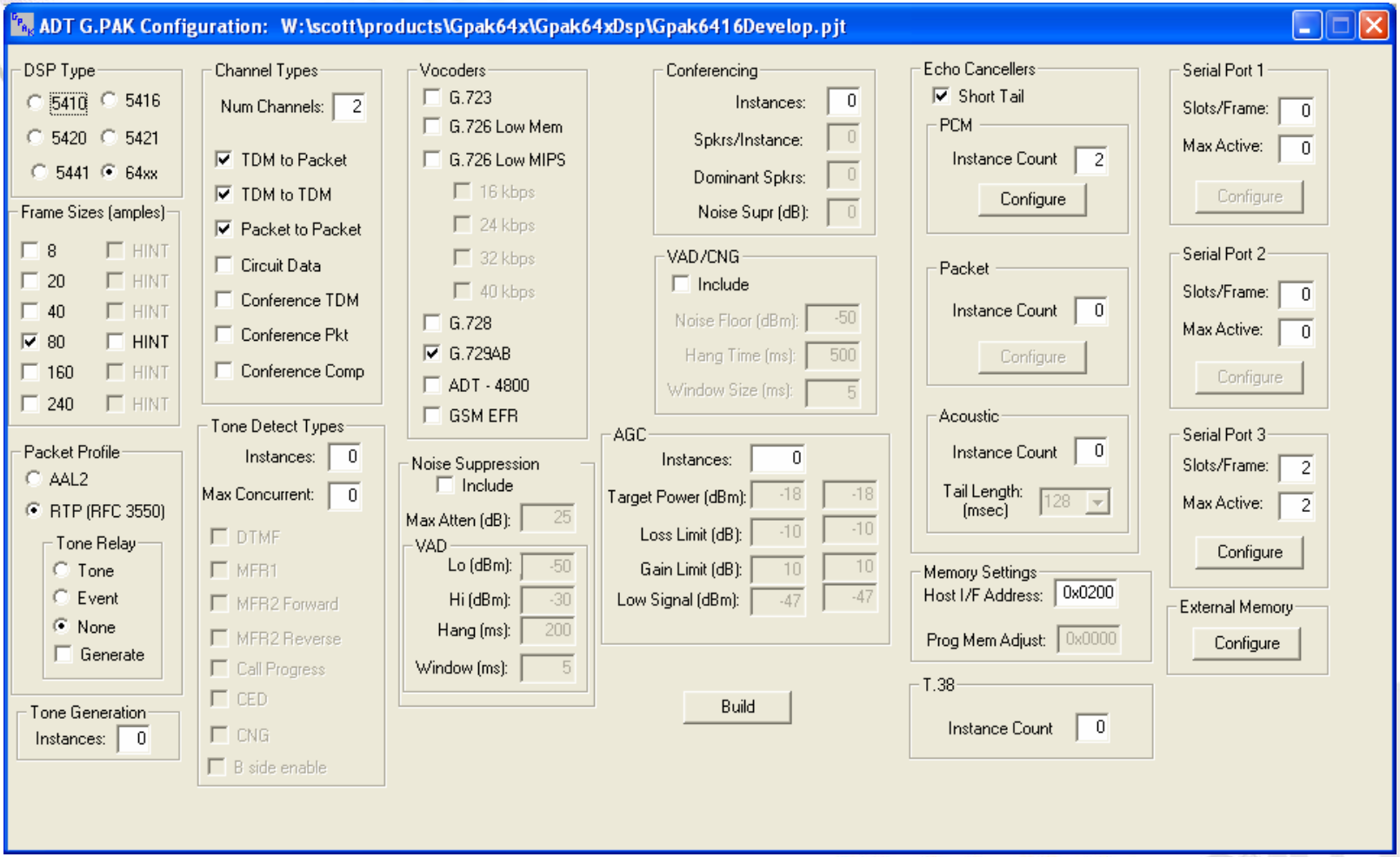
G.PAK Configuration



G.PAK Configuration Builder



G.PAK Demo
G.PAK 演示

PC Emulates
Host Processor
Running G.PAK API

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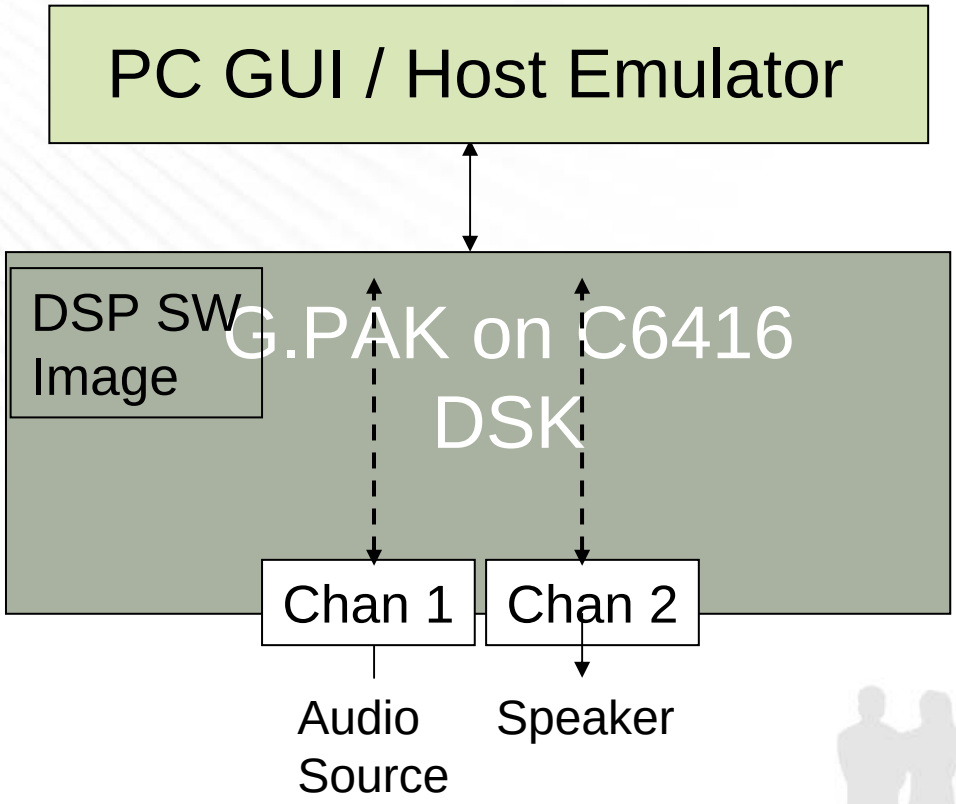
VoIP G.PAK Demo
VoIP G.PAK演示

Download
程序载入

Setup McBSP
串口设置

Setup Channel
通道建立
(PCM to Packet)



Summary: How Do We Close the Voice Quality Gap?
总结：如何提高话音质量

- Mitigate The Effects of VoIP Impairments
  弥补VoIP系统的不利影响
- Use Wideband Audio
  使用宽带声音信号
- Use Algorithms That Work Together
  使用集成处理算法
- Package it all in ASSPs To Achieve Fast Time To Market
  可载入ASSP软件加快进入市场速度

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