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# Global Public Health Intelligence Network (GPHIN)

**AMTA**  
**August 2006**

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GPHIN Technical Advisor and Project Coordinator

# Global Public Health Intelligence Network (GPHIN)

This presentation will discuss:

1. What is GPHIN?
2. How does it work?
3. Effectiveness
4. Workflow
5. Machine Translation

# What is GPHIN?

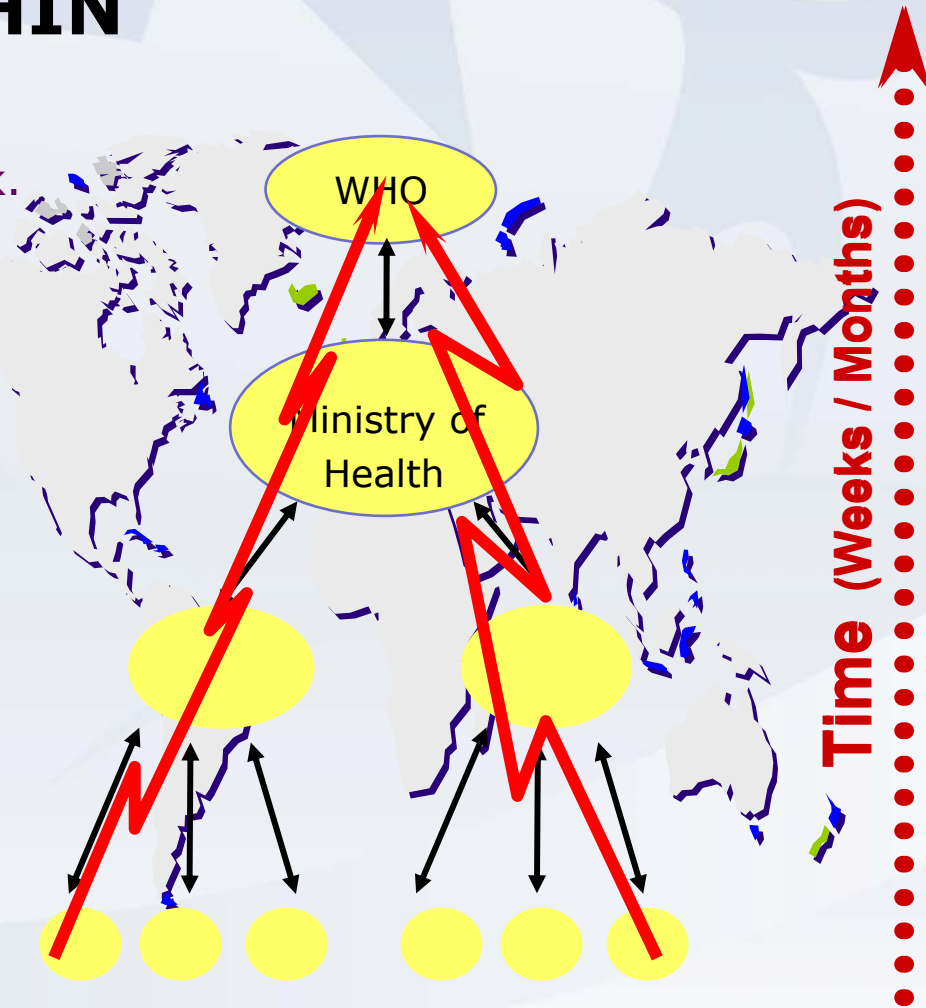
- A 'solution' comprised of a team of analysts directing a very innovative and unique technology.
- The 'Team':
  - Multi-ethnic
  - Multi-cultural
  - Multi-lingual
  - Multi-disciplined
  - Synergy

## Goal

- Provide to decision makers, early warning intelligence of potential public health threats to aid them in the avoidance, mitigation and management of an 'event'.

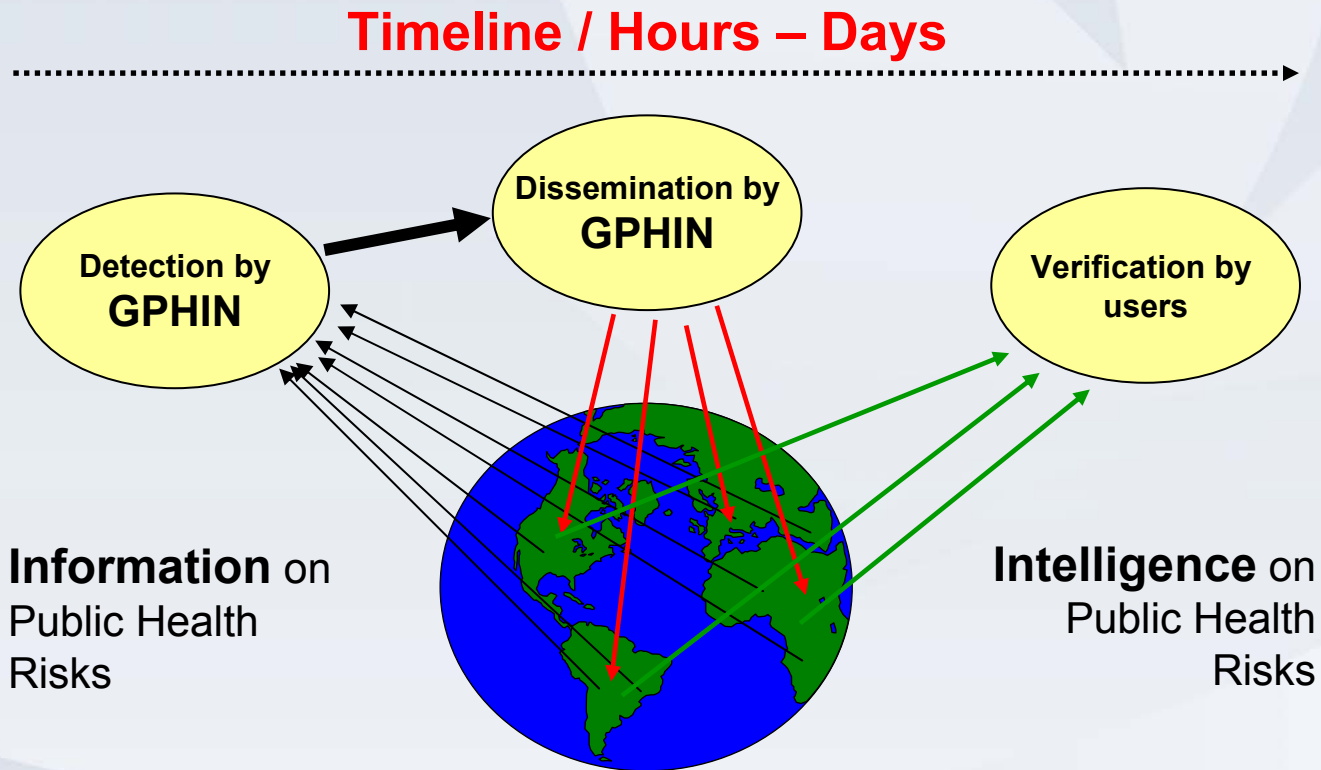
# Traditional PH Surveillance Paradigm and GPHIN

- Regional / International level
  - Analysis and Feedback. Support
  - Policy, target funding
- Central level
  - Analyze, Investigate, Confirm, Plan, Fund, Respond, Feedback
- Intermediate level
  - Analyze, Investigate, Report, Respond, Feedback
- Peripheral level
  - Detect, Treat, Report



**GPHIN – Early Warning System**

# GPHIN's Modus Operandi



- **Over 10,000 sources of information**
- **Arabic, English, French, Spanish, Russian, Chinese (Traditional & Simplified), Farsi**

# GPHIN Taxonomy Topics

- ✓ Human diseases – e.g. ebola
- ✓ Animal diseases – e.g. streptococcus suis
- ✓ Plant diseases – e.g. Asian soybean rust
- ✓ Other Biologics – e.g. anthrax
- ✓ Chemical incidents – e.g. chlorine plume
- ✓ Radioactive exposures – e.g. Chernobyl
- ✓ Unsafe products – e.g. Prozac, NSAID
- ✓ Natural Disasters – e.g. tsunami, 26 Dec 04



# Public Health Organizations at the International Level

- WHO – World Health Organisation
- PHAC – Public Health Agency of Canada
- CDC – Center for Disease Control
- Others

# Background

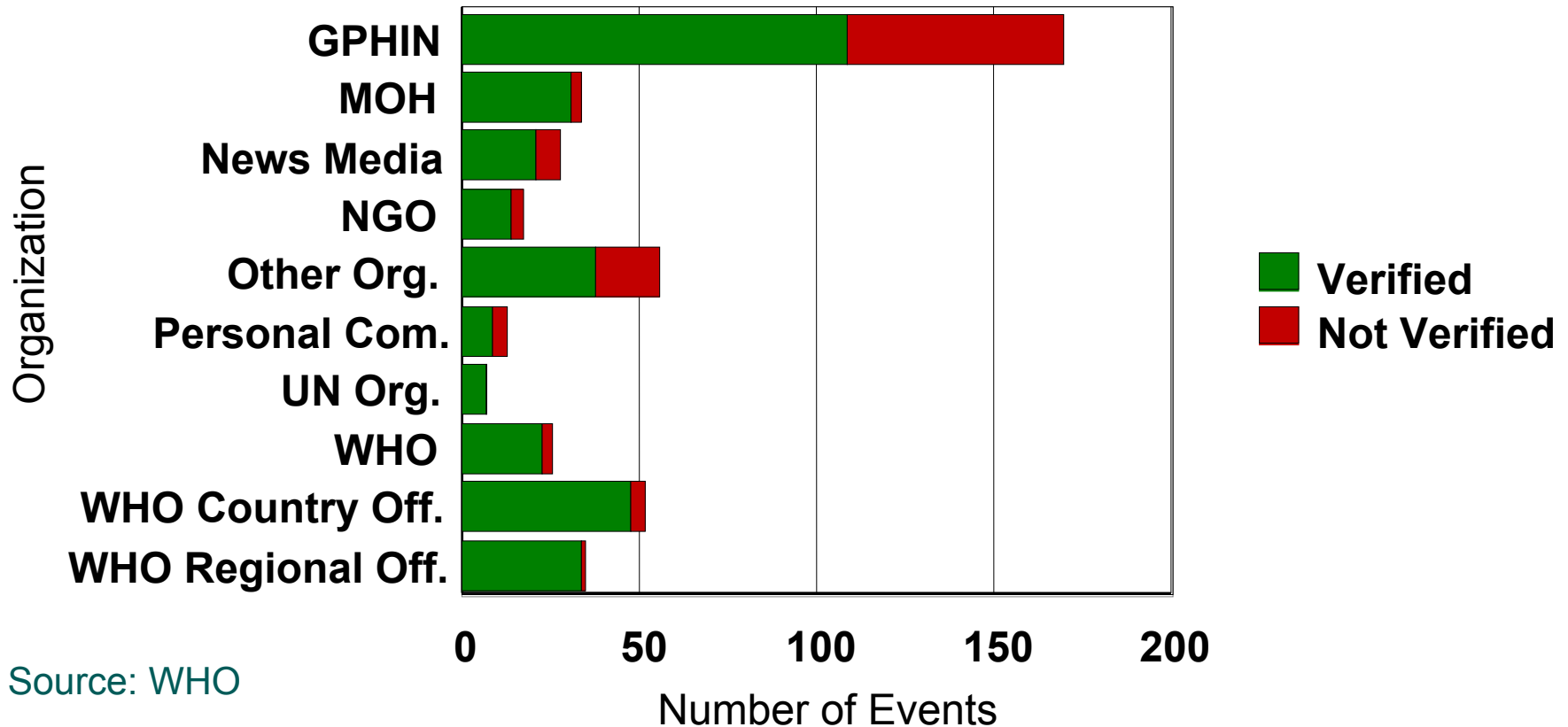
- GPHIN's Role and management
  - GPHIN was developed by the Public Health Agency of Canada
  - Managed by the Agency's Centre for Emergency Preparedness and Response
- GPHIN's history
  - 1997 – Idea of two Health Canada physicians
  - 1998/99 – Prototype developed by Health Canada in partnership with WHO
  - 2000 – Proof-of-concept
  - 2001 – Prototype deployed into production
  - 2002 – SARS
  - 2003 – Collaborative Research Agreement with Nstein Technologies Inc.
  - 2004 – Official launch of GPHIN II at United Nations

# Effectiveness evaluation criteria

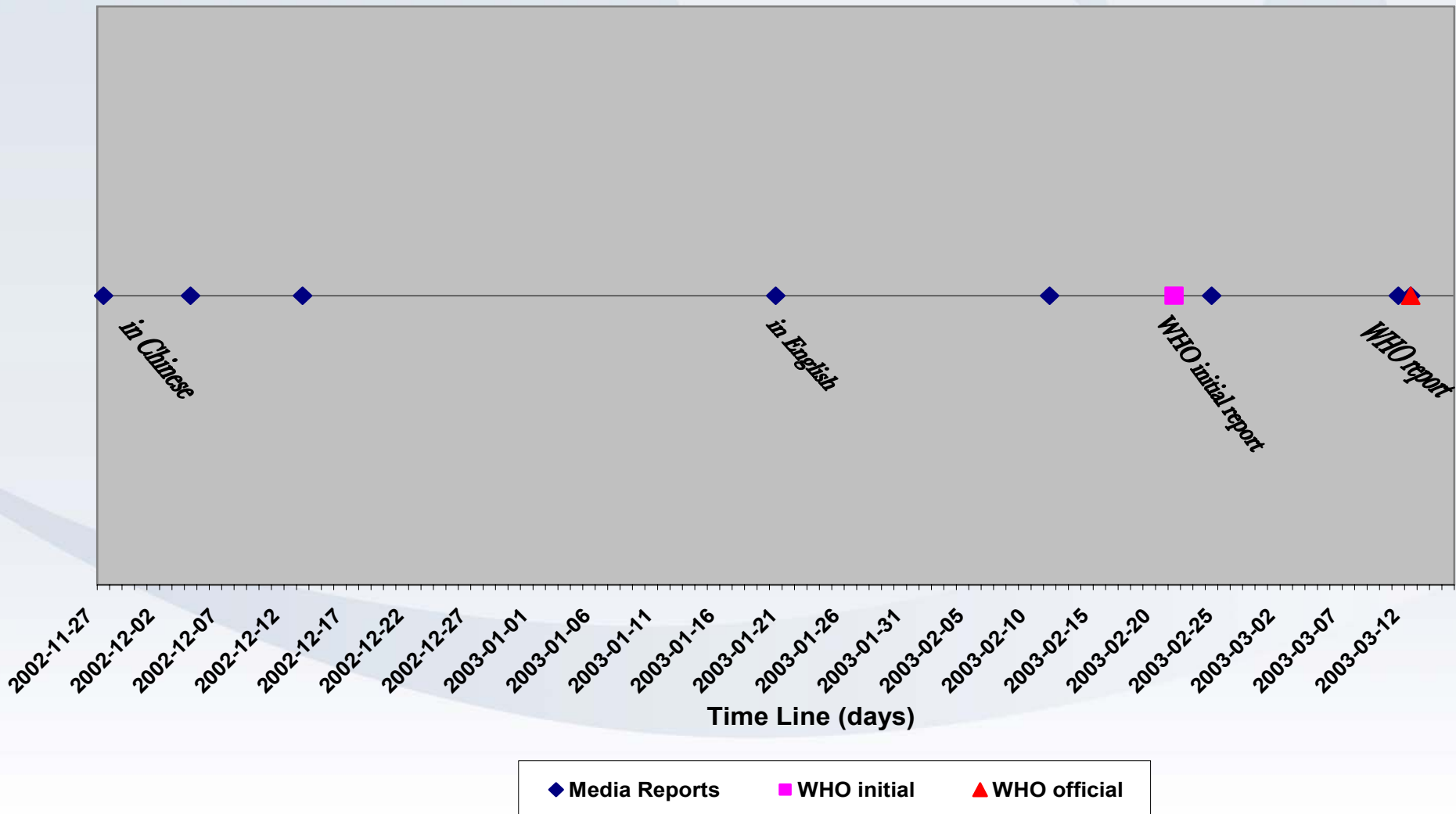
- **Usefulness** (specificity): reports' value
- **Timeliness**: speed reports are available
- **Sensitivity**: relevancy of reports
- **Flexibility**: ease to make modifications
- **Stability** (robustness): downtime, staffing
- **Cost**: sustainability

# Source of Initial Reporting of WHO Reported Events of Potential PH Concern

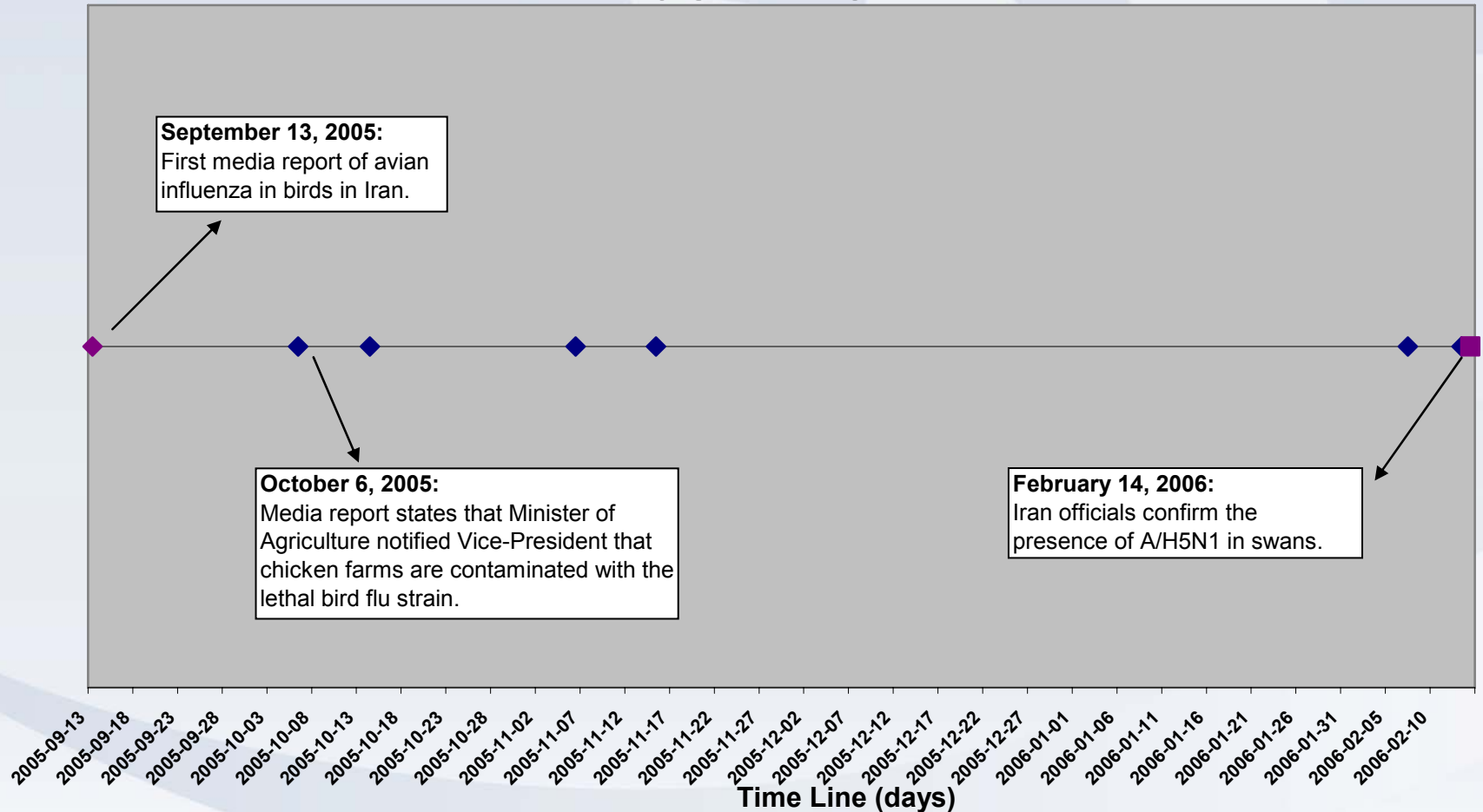
01 Jan 2001 to 31 Dec 2002. (n=439)



# GPHIN's Reporting Suggestive of the Early Detection of an Unusual Event (SARS?) in China



# GPHIN's Early Reporting of the Presence of A/H5N1 Virus in Iran



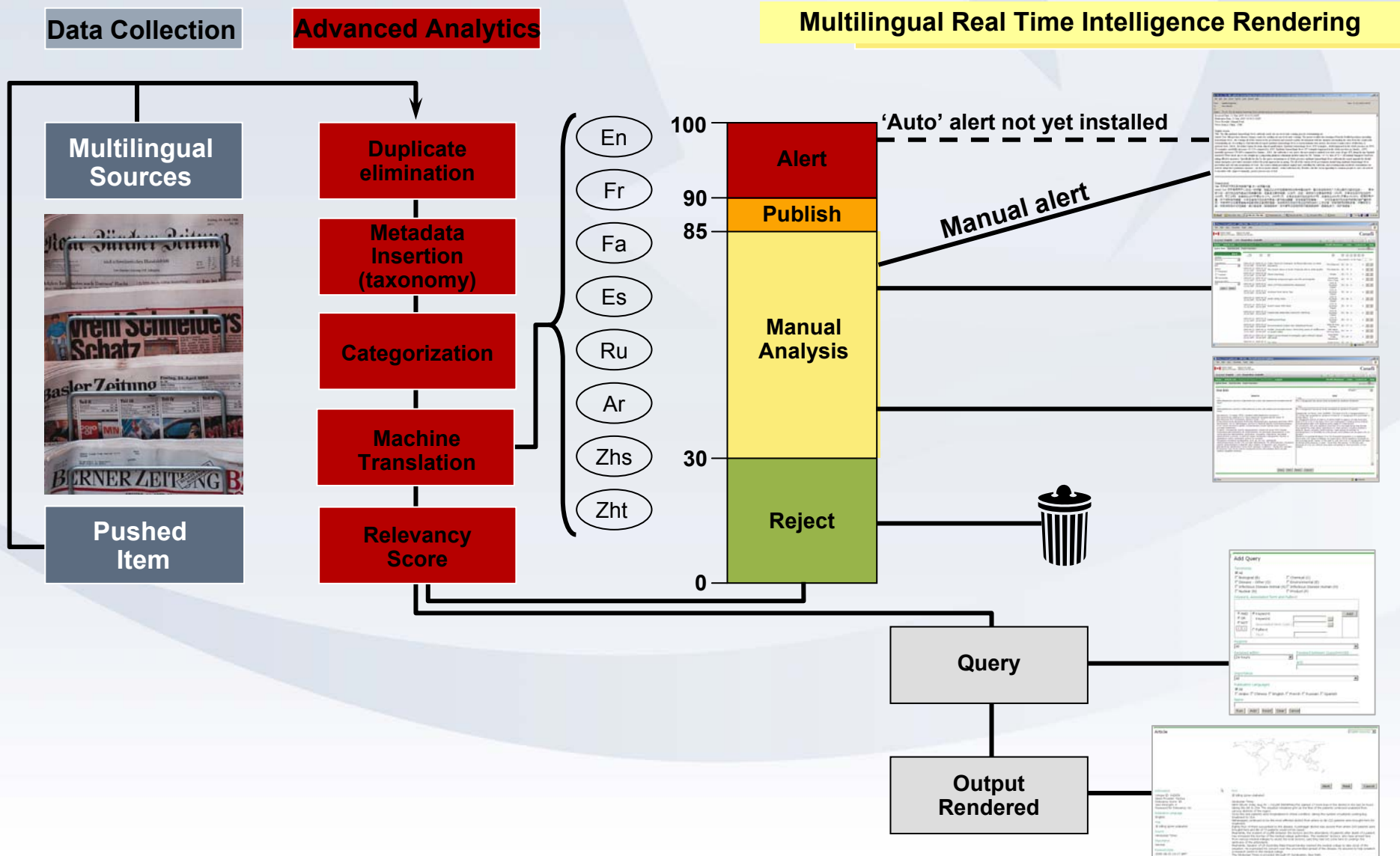
- ◆ Initial report about the presence of avian influenza in birds in Iran - not confirmed by Iranian officials
- ◆ Media reports about the presence of avian influenza in birds in Iran - not confirmed by Iranian officials
- ◆ Media report about the presence of avian influenza in birds in Iran - confirmed by Iranian officials

# **GPHIN's Versatility**

## **– Information for Action**

- *Detect* potential public health threats (PHT)
- *Estimate* magnitude of the PHT
- *Determine* geographic distribution of the PHT
- *Identify* control and preventative measures considered and implemented
- *Monitor* concerns of the general public
- *Observe* situational politics

# GPHIN Workflow






# Machine Translation


- Gatekeeper / Analysts with topical expertise plus linguistic skills provide 'quick' post editing 'GISTS' to improve 'comprehensibility'
- "Best-of-Breed" – currently 5 MT engines
- Dictionaries / lexicons
  - Corpora
  - Taxonomy
    - Root term, synonyms
    - Spelling variants of root terms and synonyms
    - Acronyms, abbrev., colloquial terms
- Meta Data – trans-lingual text mining


# GPHIN's Post Editing Mechanism




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Gphin Main | Gist Bucket | Push Function
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Chinese

| Source   | Gist  |
|--|---|
| <p><b>Title</b></p> <p>Aggressive visitors carry alarming buzz; The bees are known for their potential to swarm, then attack</p> <p><b>Text</b></p> <p>Aggressive visitors carry alarming buzz; The bees are known for their potential to swarm, then attack</p> <p>MANATEE<br/>They can deliver 1,000 stings in one minute. People who have died after being stung by them routinely have 40 stings per square inch on every bit of their exposed skin. And now the African honeybee - the killer bee made only slightly more monstrous by Hollywood - has been discovered in the Tampa area and could be in Manatee County, said a University of Florida entomologist who has studied them in Costa Rica and in their native Africa. "It's hard to tell if they are in Manatee County and I wouldn't venture a guess," associate professor Glenn Hall said by phone Monday. "It will probably be a year or two if they aren't here already. They are getting established." The killer bee is actually slightly smaller than the European bee, which is used by beekeepers in Manatee County for honey and crop pollination. The African bee also has 10 percent less venom, Hall said. But what it loses in size, it makes up in numbers. "It is the large number of stings that cause the problem," Hall said. "We usually say 1,000 stings is a lethal dose and they can deliver that in one minute." The African bee is exceptionally defensive. If its colony is approached, even by a passerby who means no harm, the bees have been known to pursue a fleeing subject for a quarter of a mile, Hall said. Don't panic, Hall advises, even though his stories of the bee are alarming. "A European bee will pursue 50 to 100 feet and quit," Hall said. Hall has been able to create genetic markers for the African bee. He can extract the DNA from dead bees to analyze if they are the variety with attitude. Hall's advice to Manatee County: "Right now I wouldn't worry about it," he said. "We've had some stinging incidents (in Florida), but most have been with animals." When African bees leave the ports in Florida, they have no choice but to mate</p> | <p><b>* Title</b></p> <p>侵略性访客带着使人惊恐的吱吱声,蜂被为他们的潜力知道爬,那时攻击</p> <p><b>* Text</b></p> <p>侵略性访客带着使人惊恐的吱吱声,蜂被为他们的潜力知道爬,那时攻击</p> <p>海牛<br/>在一分钟中他们能送交1,000刺。已经随而过世,在被他们例行公事地刺痛之后的在的人们有每平方英寸的40刺在全部他们的暴露的皮上。<br/>和现在非洲人蜜蜂经过好莱坞使-非洲蜜蜂变得仅仅略微更可怕的已经被在坦帕区域中发现和能是在海牛县中,对说一位佛罗里达大学昆虫学家,其已经研究在哥斯达黎加和在他们的故乡非洲的他们。<br/>星期一副教授Glenn霍尔通过电话对说"它是难以说如果他们是在海牛县中和我不得冒失去一个猜想"的危险.它将大概是一年或者二,如果他们不已经在这里,他们正变得确立.非洲蜜蜂事实上是与欧洲蜂,被在海牛县中的养蜂人为蜂蜜和作物传粉使用相比略微更小.霍尔对说非洲人蜂也让更少恶毒10百分之一。<br/>但是,它在数量上编造它在大小中失去的。<br/>霍尔对说"正是许多的刺造成的问题"的."我们通常对说1,000刺是一致死量和在在一分钟"中他们能送交那个。<br/>非洲人蜂特别是防御性.霍尔对说如果它的殖民地被接近,甚至经过一个有害人的意思没有的过路人,蜂已经被知道一从消失科目是一英里的四分之一例追赶。<br/>不确实惊恐不安,霍尔提供意见,尽管他的蜂的故事是使人惊恐的。<br/>霍尔对说"一只欧洲蜂将追赶50向100脚和离开".<br/>霍尔已经能建立为非洲人蜂基因标志.他能从死了蜂摘取脱氧核糖核酸分析,如果他们标新立异本来打算种类的。<br/>霍尔的向海牛县的忠告:他对说"现在我不得担心它". "我们已经中的一些(在佛罗里达)的刺痛的事件但是绝大部分已经是和动物".<br/>霍尔对说当非洲人的时候,蜂把港口遗留在佛罗里达,他们不是精选让但是对欧洲蜂的是一好事情的配偶。<br/>霍尔对说中最好的控制蜂的希望在于本地养蜂人,其能生产这样多的雄性欧洲雄蜂使更平静后代和他们生产的非洲人蜂交配。<br/>霍尔对说我们确实有关注那蜂人口可以达到一非洲人蜂在那里发现彼此和彼此繁殖多达的临界质量</p> |

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## **GPHIN News Feeds: unverified, publicly available**

- Poetic licence or polysemic terms
- Deliberate / accidental mis-use of words
- Mis-spellings
- Local vocabulary
- Style of prose
- Presence / absence of diacritics
- Abbreviations
- Spacing of letters of a word
- Capitalization
- Chinese grammar rules
- Quirks & twists

# Poetic licence or polysemic terms

- Example #1 (French)
  - “No beef in cattle bailout”
  - “Aucun boeuf dans le saut du bétail en parachute”
- Example #2 (Spanish)
  - “Injured bats in rabies alert”
  - “Bates heridos en alert de rabia” vs  
“Murcielagos heridos en alerta de rabia”

# Poetic licence or polysemic terms cont'd

- Example #3 (Farsi):
  - دختر ۱۲ ساله به دست برادرش پیر شد
  - “A 12 year old year girl was ‘**plucked**’ by her brother”
  - Writer meant: “A 12 year old girl was **killed** by her brother”
- Example #4 (Farsi):
  - دو قلم مواد بهداشتی در سمنان غیرقابل مصرف اعلام شد
  - 2 **pens** of health products are prohibited for usage in Semnan.
  - 2 **kinds** of health products are prohibited for usage in Semnan.

# Deliberate / accidental mis-use of words

- Example #1
  - “China pesa demasiado” = “China weighs too much”
- Example #2
  - “Aggressive visitors carry alarming buzz ...”
- Example #3 (Arabic)
  - **الزراعة** ترصد مع مكتب الاوبئة الدولي ظهور حالات جنون البقر = “**The agriculture** with the international ...” (the ‘Ministry of Agriculture’ is implied)

# Mis-spellings

- Example #1
  - “Global News Bites” = “Las Noticias Globales Muerden” vs  
“Global News Bits” = “Las Noticias Globales Pulsaciones ”
- Example #2
  - “Penguin Sex Deaths”

# Local Vocabulary (slang)

- Example #1
  - “anthrax”, proper Russian term = сибирская язва
  - Local term = сибирк\*
- Example #2
  - “Time for cha” vs “Time for tea”
- Example #3
  - Proper term: Tuberculosis-----肺結核
  - Local term: Tuberculosis-----癆病
  - Proper term: Chickenpox-----水痘
  - Local term: Chickenpox-----禽痘



## Style of prose

Bad Example:

- 疑他人举报投毒泄愤夜黑风大伤及大量“无辜”  
国有林场大面积绿草 幼树被毒死

Translates to:

- The child sets up green grass of the night  
reshahar doubting that others reports on a  
poisoning giving vent to self's anger is hurt  
heavily and in large amount "innocent" state-  
owned forest farm large area being killed with  
poison

## Style of prose, cont'd

### Good Example:

- 据悉，本田 F C X 符合美国政府所有的安全标准。它的驾驶方式和普通汽车一样，噪音比普通车小，燃料箱里装的是压缩氢气而不是汽油，排放完全是水，加满氢气一次能跑 3 0 0 公里。

### Translates to:

- By report, Honda FCX accords with all USA government safety standards. It Driving way is same as average automobile , noise is smaller than ordinary vehicle, in the fuel cell being pretending compresses a hydrogen but being not that the gasoline , blowoff are complete is water, Jiaman hydrogen one. Can run 300 kilometres time.

## Style of prose, cont'd

### Yellow Fever

18 November 2003

Tampa Tribune

An epidemic of *penalties* have thwarted many drives, resulting in a three-*game* losing streak and essentially leaving the Bucs' season on life support.

### Yellow fever grips Oasis

24 February 2006

Kalgoorlie Miner

AN OUTBREAK of yellow fever struck the Oasis last Friday when John Paul College held its annual *swimming* carnival.

# Presence / absence of diacritics

- Example #1
  - tâche = task
  - tache = stain, speck
- Example #2
  - When an apostrophe replaces a letter and the next letter has a diacritic:
  - “.. à l'énergie atomique ..” = “.. at l 'atomic energy ..”

# Abbreviations

- Example #1
  - РОССЕЛЬХОЗНАДЗОР ГАРАНТИРУЕТ БЕЗОПАСНОСТЬ ..  
translates to: ÆÏÑÑÅËÛÕÎÇÍÀÄÇÎÐ  
GUARANTEES SAFETY ..  
РОССЕЛЬХОЗНАДЗОР is the Russian Agriculture Control Authority
- Example #2
  - .. почти до 2 **тыс (thousand)** гектаров  
.. = .. up to 2 **òûñ** hectares ..


# Spaces within a word

- Example #1
  - “С Р О Ч Н О Министры стран ...” where
  - “С Р О Ч Н О” (with spaces between letters should be “U R G E N T” but translates to:
  - “WITH R ABOUT CH N ABOUT Ministers of the countries ...”
- Example #2
  - 新华社信息石家庄 5 月 1 3 日电 (13 May) =  
“ .. Shijiazhuang, **May 1** XinHua ..”

# Capitalization (in place names)


- Example #1
  - АРМЕНИЯ (Armenia) = ÀԾÌĀÍÈՅ
- Example #2
  - ЕРЕВАН (Yerevan, capital of Armenia) = ÀԾĀĀĀÍ

# Chinese grammar rules



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[Gphin Main](#) | [Gist Bucket](#) | [Push Function](#)

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Chinese

### Source

**Title**

Aggressive visitors carry alarming buzz; The bees are known for their potential to swarm, then attack

**Text**

Aggressive visitors carry alarming buzz; The bees have their potential to swarm, then attack

MANATEE  
They can deliver 1,000 stings in one minute. People who have died after being stung by them routinely have 40 stings per square inch on every bit of their exposed skin. And now the African honeybee - the killer bee made only slightly more monstrous by Hollywood - has been discovered in the Tampa area and could be in Manatee County, said a University of Florida entomologist who has studied them in Costa Rica and in their native Africa. "It's hard to tell if they are in Manatee County and I wouldn't venture a guess," associate professor Glenn Hall said by phone Monday. "It will probably be a year or two if they aren't here already. They are getting established." The killer bee is actually slightly smaller than the European bee, which is used by beekeepers in Manatee County for honey and crop pollination. The African bee also has 10 percent less venom, Hall said. But what it loses in size, it makes up in numbers. "It is the large number of stings that is the problem," Hall said. "We usually say 1,000 stings is a lethal dose and will die in one minute." The African bee is exceptionally defensive. It is known to pursue a fleeing passerby who means no harm, the subject for a quarter of a mile, Hall said. Don't panic, Hall advises, even though his stories of the bee are alarming. "A European bee will pursue 50 to 100 feet and quit," Hall said. Hall has been able to create genetic markers for the African bee. He can extract the DNA from dead bees to analyze if they are the variety with attitude. Hall's advice to Manatee County: "Right now I wouldn't worry about it," he said. "We've had some stinging incidents (in Florida), but most have been with animals." When African bees leave the ports in Florida, they have no choice but to mate

### Gist

**\* Title**

侵略性访客带着使人惊恐的吱吱声; 蜂被他们的潜力知道爬, 那时攻击

**\* Text**

侵略性访客带着使人惊恐的吱吱声; 蜂被他们的潜力知道爬, 那时攻击

海牛  
在一分钟中他们能送交1,000刺。  
已经随而过世, 在被他们例行公事地刺痛之后的在的人们有每平方英寸的40刺在全部他们的暴露的皮上。  
和现在非洲人蜜蜂经过好莱坞使-the非洲蜜蜂变得仅仅略微更可怕的已经被在坦帕区域中发现和能是在海牛县中, 对说一位佛罗里达大学昆虫学家, 其已经研究在哥斯达黎加和在他们的故乡非洲的他们。  
星期一副教授Glenn霍尔通过电话对说"它是难以说如果他们是在海牛县中和我不得冒失去一个猜想"的危险, 它将大概是一年或者二, 如果他们不已经在这里, 他们正变得确立。非洲蜜蜂事实上是与欧洲蜂, 被在海牛县中的养蜂人为蜂蜜和作物传粉使用相比略微更小。霍尔对说非洲人蜂也让更少恶毒10百分之一。  
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霍尔已经能建立为非洲人蜂基因标志。他能从死了蜂摘取脱氧核糖核酸分析, 如果他们标新立异本来打算种类的。  
霍尔的向海牛县的忠告: 他对说"现在我不担心它"。"我们已经有一些(在佛罗里达)的刺痛的事件但是绝大部分已经是和动物"。  
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霍尔对说我们确实有关注那蜂人口可以达到一非洲人蜂在那里发现彼此和彼此繁殖多达的临界质量

Save

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# Quirks and Twists

- Example #1
  - AIDS: ----愛滋病 ----- “love growing disease”
- Example #2
  - حديدة Hodeida: A city in Yemen
  - حديدة Hadida: Iron in Arabic

The reader has to understand the sense of the phrase to decide how to pronounce the word
- Example #3
  - **حالتا** وفاة بالحمى المجهولة وأزمة في اسعاف المصابين  
translates to:  
Death **cases** by the unknown fever .. When it should translate to **TWO cases**

# Integration Issues

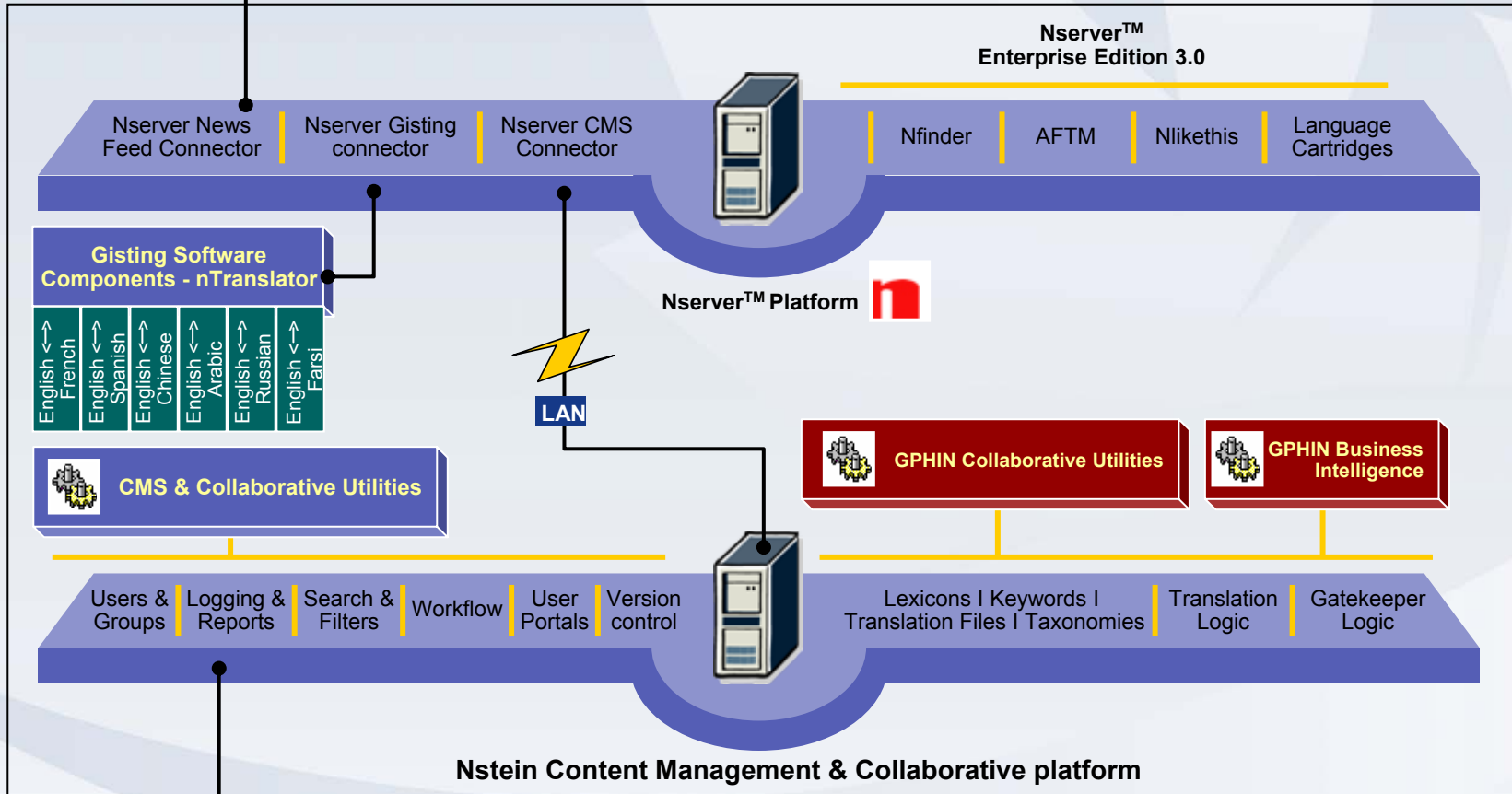
- Awkward API's
- Poor documentation
- Lack of standards for dictionaries / lexicons
- Bugs
- Clashes between different manufacturers

# Operational Issues

- Inherently unstable code
- Bugs
- Crashes
- Unpredictable performance

**GPHIN Data Sources**

**GPHIN Infrastructure**



**Output: Your Intelligence**

# nTranslator™

nTranslator™

English ↔  
Farsi

English ↔  
French

English ↔  
Spanish

English ↔  
Chinese

English ↔  
Arabic

English ↔  
Russian

# nTranslator™

- Overcomes some of the integration and operational issues:
  - Normalizes API's
  - Detects 'engine' crashes / freezing and re-boots
  - Overcomes incompatibilities
  - Solves display / rendering problems
  - Converts file formats

# Recommendations

- Translation memory
- Transliteration
- Tighter code to improve hardware efficacy
- Standardization
- Hybridization

# Questions ??

The background features several light blue, semi-transparent graphics. On the right side, there is a stylized human figure with arms raised. In the center, there is a crown-like shape. At the bottom, there is a bar chart with several vertical bars of varying heights.